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MARY WIBEL, *Editor*

MARCH, 1949 **Volume 20, No. 1**

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Some Aspects of the Role of Games, Sports, and Recreational Activities in the Culture of Modern Primitive Peoples

II. The Fijians

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University of California
Berkeley, California
(Submitted for publication, August, 1948)

PURPOSE

IN the following study of Fiji, which appears as the second under the general title of "Some Aspects of the Role of Games, Sports and Recreational Activities in the Culture of Modern Primitive Peoples," we have in mind the same general purposes as were outlined for the first study on the New Zealand Maoris (23) which appeared in a previous issue of the *Research Quarterly*. Such studies utilize source material rich in possibilities for the student in physical education or recreation, and present infinite opportunities for essential contributions to the historical backgrounds in our literature (22).

The importance of such studies as an aid to the understanding of sociological phenomena can be more fully realized when culture is viewed as a gigantic conditioning process, amalgamating nurture with nature, and which, through the imparting of skills, the teaching of norms, the development of tastes, produces human beings whose behavior cannot be understood or determined by a study of anatomy and physiology alone (16).

With the evidence in mind that games, sports, and recreational activities constitute one of the universal elements of human culture, an attempt will be made in the study of Fiji to examine this culture element in its functional aspect as an integral part of culture contact and culture change.

Culture change may be defined as the process by which the existing order of a given society — its social, spiritual, and material civilization — is transformed from one type to another. In our time all primitive cultures are gradually being transformed into some-

thing which approximates Western civilization (16). It may be that some conclusions, valid and valuable with reference to primitive peoples might be successfully applied to our own society since a study of this process of transformation has revealed that there is a common measure between *all* human cultures.

Any modern study of primitive people will indicate the essential identity of all cultures in underlying habits and modes of thought, in human purposes and aspirations. What emerges to astonish the student is not the submissiveness of primitive life, but its ***creative adaptability*** (10). To trace the part played by the culture element which we identify broadly as games, sports, and recreational activities in the process of "creative adaptability" in primitive society is a fascinating and rewarding study. Because the setting is in a relatively simple culture-pattern the investigation is made easier. However, the implications for such studies within our own civilization with its exceedingly complex culture, are inescapable.

The fact that our so-called Western civilization has been subjected to such revolutionary changes in economy, social customs, and ethical concepts has resulted in institutions and values marked by functional incoherence and a lack of clear-cut orientation. For this reason, the study of culture elements which may contribute to a process of creative adaptability becomes imperative. No less an authority than Arnold J. Toynbee (26) assures us of the importance of games and sports to the well-being of individuals living under the conditions imposed by our modern industrial culture. He further assures us that it is no accident that organized games and sports have grown in popularity with the rise of industrialism; and that such sport "is a conscious attempt to counter-balance the soul-destroying specialization which the division of labour under industrialism entails."

All individuals engaged in the gigantic enterprise which is American education, and who are groping their way toward an understanding between social phenomena and the educative process, must eventually recognize that it is as important to understand the recreational phases of culture as it is to understand the economic, familial, religious, or political (20).

SOURCES OF REFERENCE

What is known of the story of Fiji and the Fijians as they were at the time of the first sustained contact with the white man and his civilization must be gleaned from works based on eye-witness testimony. There are no works of professional anthropologists to which reference can be made. The use of such "alien" sources proceeding from direct, personal observation and reporting of fact, who

did what to whom, when, where, and in what fashion, is " . . . many times as valuable as a general statement in Y's book, when Y got his material from the work of Z" (4).

The Fiji Islands exhibit an amazing diversity, both cultural and linguistic. The earlier writers did not often give exact locations for the activities they described but were content to treat Fiji as a cultural whole. Thus an attempted reconstruction of the recreational and sports life of the Fijian must necessarily represent guesswork, in some instances, as to the particular tribe under discussion. This deficiency is more than compensated for by the fact that these earlier writers had for the most part a long acquaintance with the natives when their culture was but slightly affected by European contacts, and it seems reasonable to give their accounts at least the benefit of the doubt (21).

What has been attempted in this study is a synthesis of the descriptions given by missionaries, traders, explorers, and early governmental representatives, for the purpose of reconstructing the recreational and sports life of the Fijian and to work toward an understanding of its role in the culture as a whole.

A fundamental requirement for the successful operation of any society is the maintenance of the equilibrium of the individual, and of the group or groups of which he is a part (4). Within this framework of maintaining equilibrium, single activities often play more than one role. Among human beings the playing of games is universal, and in a sociological sense such games serve a number of purposes. They provide a routine for people to follow when they come together for a ceremony, and give rival institutions a chance to work off steam (4). In this same sense, the playing of games may serve a vital and important function as routines of *interpersonal and intervillage interaction.*

To trace the story of Fiji from the beginning of prolonged culture-contact with the white man and his civilization, we have used in the main the following: The *Journal* of William Lockerby (12); the works of Reverend Thomas Williams (28) and Reverend Walter Lawry (14); the *Narrative* of Captain Wilkes (27) of the U. S. Exploring Expedition, and the *Journal* of Captain Erskine (7) of the British Navy; the works of A. B. Brewster (3) and Sir Basil Thomson (25), both long-time residents and government servants concerned with the conduct of native affairs.

As a most valuable aid in our attempted evaluation of the materials contained in the above references, we have made extensive use of the fine study of G. C. Henderson (11) of Australia, *Fiji and the Fijians*: 1835-1856, published in 1931. Professor Henderson, in the course of his investigations in Australia, Fiji, and England, had access to original documents never before utilized for the purpose

of compiling a history of the transition period in Fiji from the old order to the new. Since direct use of these original sources* is not possible for the purpose of completing this study, we are most happy to use Professor Henderson's book as a secondary source, and as a check on our own reactions to and opinions of original publications which are available.

FIJI: THE COUNTRY

The status of Fiji as a British Crown Colony has remained unchanged since its annexation in 1874. Fiji, where the races and cultures of Melanesia and Polynesia meet, is composed of some two hundred and fifty islands, ranging in size from small atolls to the great island of Viti Levu covering some four thousand square miles. Some eighty to ninety of these islands, clustered near the international date line which separates the western and eastern Pacific, are inhabited. The Fijian population was estimated in 1859 at 200,000. The census of 1921 recorded 84,475 and by 1940 this figure had increased to 104,872. The climate is cool for the tropics and the country is non-malarial and remarkably free from endemic diseases (19).

In the middle of the last century the population of Fiji was broken up into a number of communities ruled over by chiefs, some of whom were independent; others were more or less subject to a ruling chief or king, but enjoying some measure of independence. There was no sovereign authority in Fiji strong enough to impose his will on all the people, and one result of this lack of unity was war. In the large islands of Viti Levu, Vanua Levu, and Taviuni such incessant warfare was made almost inevitable by the cupidity and pride of ambitious chiefs who lost no favorable opportunity of striking a blow for their own self-aggrandizement (11).

The power of the Fijian chiefs over the daily work and play of the natives was absolute. Theirs was the responsibility of leadership, counsel, and guidance; but theirs also was the role of rulers and overlords, intolerant of disobedience or disloyalty (5).

THE FIJIAN AS A CHILD AND AS AN ADULT: PHYSICAL AND PERSONALITY ATTRIBUTES

The absence of descriptions of means and methods of child care and education in the early records of the missionaries and traders is not evidence that a systematic body of procedures did not exist. Certain methods and mechanisms of an educational character exist in every culture (16).

When Williams (28) says:

* Original manuscripts in the Mitchell Library, Sydney, the British Museum, and the archives of the Methodist Missionary Society, London.

> Family discipline is unreal, and its apparent restraints easily set aside. Children stray away at pleasure, and very soon become independent of their parents, by whom they are taught to dance, to plant, and to fight,

he is making a greater contribution to our knowledge of the situation as it existed than he realizes!

As an observer, Captain Erskine (7) shows much greater perspicacity when he says:

> How the education of the children is managed I had no means of ascertaining, but, when we consider their acquirements, it is evident that it must be conducted with no little care. Perfection in the athletic exercises of swimming, throwing the spear or club, and handling a canoe, seems to be attained at an early age, and I never met a lad or girl who was not acquainted with the native name of any blade of grass or leaf of a tree, which might be exhibited to them.

The words of Thomson (25) have a most unreal connotation to any teacher who has been concerned with the instruction of either children or adults in the art of swimming:

> Swimming seems to come naturally to every Fijian. As soon as the child can toddle, it is playing at the water's edge with older children, and little by little it ventures out until its feet are off the bottom. Being supposed to be a natural action like walking, no attempt is made to teach it.

Captain Erskine reports that the people keep their bodies well oiled, which they consider a preventative against colds. A Fijian mother desired, beyond almost all other articles of civilized manufacture, a glass bottle to contain her scented oil,

> . . . and early every morning she may be seen with her flock of little ones around her undergoing ablution, which done, she applied the contents of her bottle, until they fairly glisten (7).

Both sexes go unclad until the tenth year, and some beyond that (28). Male children are circumcised when from seven to twelve years old and this is generally performed on a company of ten or twenty at a time, who, for several days following live together in a public building.

> *Kula* is one of the names by which those who are newly circumcised may be spoken of by or before women, *teve*, the proper word, being *tabu* if a woman is present . . . The proper time for performing this rite is after the death of a Chief, and many rude games attend it. Blindfolded youths strike at thin vessels of water hung from the branch of a tree. At Lakemba, the men arm themselves with branches of the coca-nut, and carry on a sham fight. At Ono, they wrestle. At Mbau, they flip small stones from the end of a bamboo with sufficient force to make the person they hit wince. On Vanua Levu, there is a mock seige (28).

Hints as to hygienic procedures of the Fijian are plentiful. For instance, drinking vessels had usually three small holes at one end, similar to the eyes of a cocoanut. It was considered quite objectionable to put the vessel to the mouth when drinking, since it would be used by a number of persons. To avoid this contact the vessel was held eight to ten inches above the head and the water allowed to run into

the mouth as if from a spout, with the head thrown back to receive it. Wilkes comments that it is difficult to conceive the awkwardness of this strange mode of drinking, but adds that " . . . it is invariably practiced throughout the group, except by the king and high chiefs, whose drinking vessels are always tabooed" (*27*).

The Fijians have the peculiar distinction among island people, of using mosquito curtains (28), and Lockerby (12) describes the houses they lived in as

> . . . Particularly handsome, neatly worked inside with reeds; the floors are covered with mats, and are kept remarkably clean.

The Fijian was proud of his person, as Williams (28) says,

> If he can add a clean *masi* to a well-oiled body and a bushy head of hair, his eye, his step, his every attitude is proud.

Even the Reverend Lawry, while of the opinion " . . . that men in their wild heathen state are generated with a more depraved and vicious nature, than is the case in Christian and civilized countries," pays tribute to the Fijians:

> . . . there is an air of power and independence in the FeeJeeans, that makes them claim attention. They at once strike one as peculiar, and unlike other Polynesian natives, they have a great deal of activity both of mind and body, which may be ascribed, in some measure, to their constant wars, and the necessity of their being continually on the alert, to prevent surprise (14).

Following are three representative descriptions of the physical attributes of the Fijians, as recorded by the earliest European observers. William Lockerby, who was engaged in collecting sandalwood for several ships of call, makes the following entry in his Journal:

> The men are remarkably stout, well made people, and in features much resembling Europeans. They differ from other Indians in being very desirous of keeping their skin clean . . . In war they are fearless and savage to the utmost degree, but in peace their disposition is mild and generous towards their friends, and the affection they bear towards their relations is very seldom found among Europeans. Their arms consist of bows and arrows, slings, spears, and clubs, which they use very dexterously. The women are remarkably handsome, and have all that delicacy of form and softness of voice and manners, which distinguish female from the other sex in every part of the civilized world. Their virtues might be set as an example to nations who pride themselves on being far removed from them in knowledge and refinement (12).

The description of Thakombau, famous Fijian chief, written by Captain Erskine (7) is fairly well known; but is worth recalling here:

> It was impossible not to admire the appearance of the chief: of large almost gigantic size, his limbs were beautifully formed and proportioned; his countenance with far less of the negro cast than among the lower orders, agreeable and intelligent; while his immense head of hair covered and concealed with gauze, sun-dried and slightly tinged with brown, gave him altogether the appearance of an eastern Sultan. No garments confined his magnificent chest and neck, or concealed the natural color of his skin, a clear but decided black,

and in spite of his paucity of attire — the evident wealth which surrounded him showing that it was a matter of choice and not of necessity — he looked every inch a king.

Adding to the above the portrait given us by Reverend Thomas Williams (28), we have an excellent idea of the Fijian as he was.

The natives of the group are generally above the middle height, well made, and of great variety of figure. They exceed the white race in average stature, but are below the Tongans. Men above six feet are often seen, but rarely so tall as six feet, six inches. Corpulent persons are not common, but large powerful, muscular men abound. Their mould is decidedly European, and their lower extremities of the proportion generally found among white people, though sometimes narrower across the loins. Most have broad chests and strong sinewy arms, and the prevailing stoutness of limb and shortness of neck is at once conspicuous . . . and the difference between Chiefs and people is not so marked as in some groups: the lower ranks have neither the sleek skin nor portly mien of their superiors, yet supply a fair ratio of fine men, supple in joint, strong in limb, and full of activity . . . His senses are keen, and so well employed, that he often excels the white man in ordinary things.

MISSIONARIES IN FIJI

The history of the impact and influence of the missionaries on the life of the people of Fiji is interesting and extremely complicated, but not within the scope of this study. Their avowed object was to save the souls of the natives by converting them to Christianity; but in Fiji that involved a change in every aspect of their lives — political, social, economic, as well as religious (11). An adequate impression of the part played by the *meke* and other vigorous sports and recreational activities in sustaining the joyousness of the people, and in making the wheels of government run smoothly, is not to be found in the records of the missionaries in the middle of the last century. The missionaries looked upon such things with an unfavorable eye, and instead of preserving the activities and trying to purge them gradually of their objectionable elements, they adopted the usual policy of suppression (11).

The period of the history of Fiji covering the early years of missionary contact is a record of mistakes due to a lack of knowledge, the kind of knowledge which scientific investigators have acquired and made known in the years of the twentieth century. If the missionaries had known more about psychology they would have seen the danger of denuding the life of the native of so many of its sustaining interests. The missionaries of the thirties and forties of the last century had no conception of the disastrous effects of their discouragement of native recreations.

The missionary of those days was not a sportsman either by temperament or training, and he had no idea of the value of games—especially organized games—for the strengthening of moral as well as physical fibre. That was one of his misfortunes. It was unfortunate for the Fijians too. In discouraging and

suppressing so many of their innocent interests and activities the missionaries took far too much out of their lives and put far too little back to fill the void (11).

As an illustration of the changing attitude of the missionary agencies concerned with work among the Fijians, the following excerpt from a letter written to us by the Assistant General Secretary of the Methodist Overseas Missions,* dated March 13, 1947, will serve very well:

> In reply to your request for information as to the part Western sports and recreation play in the lives of the Pacific peoples, let me say that in the fields where we are working, Tonga, Samoa, Fiji, Papua, and New Britain we have introduced quite a number of Western games. These have been welcomed with some enthusiasm by the people. They have become quite expert in football, cricket, and general athletics. Doubtless these have played an important part as an equivalent of the other less desirable indigenous activities. They can sublimate their warlike instincts on the football field which is a good deal more desirable than head hunting.
>
> We have however tried on all our fields to encourage the maintenance of the best of their own leisure activities. Dancing, Kava drinking, and other important indigenous recreations are encouraged on the field by us.

THE RECREATIONAL LIFE OF THE FIJIAN

The meke** was the most fundamental form of recreation among the Fijians. There were *mekes* for men, for women, and for children, and some for men and women to dance together. Each important event in the life of a Fijian signaled the ever-recurring *meke*: birth, marriage, sickness, death, or war. There were *mekes* on the fields, the woods, tempests, calms, rains, the heavens, gods, devils, travel by land and sea, and men, women, and maids (8). Father Rougier says that it was only necessary to have seen the *meke* to be persuaded that it was "an exercise fully capable of developing all the members of the body; no gymnastic exercise can approach it" (8).

Preparations for the *meke* frequently extended over a long period and the dance was frequently rehearsed for months. The audience demanded perfection in execution and should some " . . . luckless dancer commit a fault . . . it excited loud derision by the spectators" (25).

Observers were all unstinting in their praise of the *meke* as a perfectly executed performance, " . . . timed with precision that months of practice would not achieve were there not an inborn dexterity to build upon" (25). Small boys of four and five lined the

* In 1935, Cecil Mann (17), in a monograph entitled *Education in Fiji*, published by the Melbourne University Press, stated that seven-eighths of the Fijians are nominally Methodists.

** The word *meke* might be loosely translated as "dance" but if unexplained this would be misleading. The term *meke* has primary reference to the swaying of the bodies, whether standing or sitting; and what is called a *meke* always consists of a combination of instrumental music, songs, and swaying of the bodies and other actions (11).

outskirts of the practice ground swaying their limbs and bodies in elaborate contortions which Europeans after a prolonged gymnastic training would execute very clumsily (25). Every movement, of body, head, arm, or foot, is executed as if one wire moved the hundreds of performers (25).

In a regular dress or feast dance, two sets of performers are involved, the musicians and the dancers. The dancers may number from one to six hundred, the musicians twenty to thirty persons, and the spectators, all available men, women, and children not actually engaged in the performance (28). There is always a conductor (28) and for instruction regular dancing-masters and mistresses, who are much esteemed (27). Those who can invent new figures are most in demand.

Father Rougier (8) insists that the sole object of the *meke* was amusement and exercise, that there were no superstitious ideas associated with its performance. "To assure fertility of their fields, to gain honor, success, etc., they had sacrifices and special practices," but the *meke* was their joyous expression of abounding energy, creativity in music, poetry, and story-telling, and an enthralling pride-invoking spectacle for the spectators.

Aside from the *meke, tiqua* or *tinqua* was, according to observers, the game *par excellence,* the national sport. Williams (28) describes it briefly as a game

> played by throwing from the forefinger a reed of three or four feet long, armed with a six-inch oval point of heavy wood. This weapon is made to skim along the ground to a distance of a hundred yards or more. Nearly every village has near it a long level space kept clear of grass for the practice of this favourite exercise.

Thomson (25) describes the *tinqua* as a reed four feet long, fitted into a pointed head carved out of ironwood, and explains that while reed shafts might be cut from the roadside as needed, good players regarded their ironwood heads much as golfers do their favorite driver. The feeling often ran so high when one village was pitted against another, that each side would make an offering to the gods for victory (11).

Erskine (7) commented, after watching a match at which a hundred Fijians lined the grounds to watch, that

> None of them exhibited much skill nor did the game seem to us one of any interest, and all were quiet and decorous.

However another observer (25) comments that " . . . the unpracticed European finds the knack of throwing straight very difficult to acquire."

The playing field for this game is variously described as " . . . a level well swept mall, about one hundred and fifty yards long and five

or six wide, skirted with trees and shrubs" (7); as a " . . . level stretch of bare earth over one hundred yards long by ten wide" (25); and as a " . . . course two hundred yards long by seven wide" (8); and finally as an " . . . alley about three hundred yards long and from seven to nine yards in width, covered with very fine sand, and beaten hard, or else sown with very short grass" (8).

One of the epic songs of Fiji as translated in Quain's *The Flight of the Chiefs,* relates the tale of a competitive dart-throwing contest in which village prestige was the forfeit. In a footnote Quain (18) explains that today only the older men play at "hurling the chicken head" (a descriptive native name for the game). When a village was defeated in the game the conqueror carried off a part of the turf from the defeated village as a symbol of conquest. Today this same symbolism is used in the soccer games of more sophisticated villages.

The *veidre,* or tug-of-war, belongs to the most ancient of Fijian traditions, with village pulling against village, or tribe against tribe, in the presence of a great concourse of people and pigs (8).

Labolabo kanace was a kind of leap-frog. The Fijians played the game by having one player lie flat on the ground. The second player jumped over him to lie flat a little further on. The third jumped over the other two and lay down in his turn, and so on till all were lying down, when the end man would spring up and start afresh, the others following, forming a sort of endless chain (8).

THE INTER-RELATIONSHIP OF THE RECREATION ELEMENT IN ALL PHASES OF FIJIAN LIFE

Williams (28), quite inadvertently, gives us many clues as to how successfully the recreational needs of the Fijians were met, and how essential outlets for creative energy and self-expression were supplied, within the framework and at the tempo of living represented in their own culture:

> Most of the different employments are followed by the Fijians only occasionally, and as want may make them necessary. All—even children—can do something at building, and most at canoe-cutting; but there are parts of these trades which are only undertaken by skilled workmen. When free from the claims of necessary employment, a man will rub down a large trochus for an armlet, file out a ring for his finger, or scrape into form the teeth of a comb; and it is thus that such articles are generally made. While each individual, therefore, seems averse to doing more than is absolutely necessary, yet the people generally show a fair advance in useful arts, and do a considerable amount of work.

A finer compliment to the morale of a group of workmen could hardly be conceived than that paid by Williams (28) in describing canoe-sailing:

> Canoe-sailing is not silent work. The sail is hoisted and the canoe put

about with merry shouts; brisk interchange of jest and raillery is kept up while poling over shoal reefs, and the heavier task of sculling is lightened by mutual encouragement to exertion, and loud thanks to the scullers, as each set is relieved at intervals of five or ten minutes. . . . If the canoe is sound, nothing but bad weather can spoil the enjoyment of such voyaging. *The duties of the ship are not attended to in the perfunctory style of a hired crew, but in just the same spirit as actuates friends on a pleasure trip, where each feels his own happiness involved in the happiness of all.**

Foot races were always run on occasions such as the first voyage of a canoe, or the digging of a plantation, and for a prize offered by the owner. Thomson (25) describes his first voyage in a canoe he had had built at Fort Carnarvon, and the crowd of young men waiting on the river bank, decked in streamers and shouting for the *there* (foot-race) to begin. A bale of *masi* (native cloth) was unpacked and a streamer of the cloth fastened to a stick.

With this one of the men landed, some two hundred yards lower down, and ran at topmost speed with the whole rabble baying at his heels. The man who caught him and tore the flag from him received the bale, which he afterwards divided out among the others (25).

The *mata-ni-vanua* or master of ceremonies held a responsible position in Fijian society since all public business was conducted with rigid formality, elaborate ceremonial, and strict observance of ancient custom. Any serious breach of etiquette or errors in precedence might lead to feud, bloodshed, or even war. Events of major and even minor importance had their appropriate ceremonies: the installation of a ruling chief; the approach and welcome of visitors of rank; the presentation of property, feasts, and first-fruits; birth, coming of age, marriage, death, and burial; the departure and return of war parties; the stages in the building of a war-canoe, and the event of its maiden voyage; the setting up of timbers for temples and chiefs' houses, all had their traditional rites (6).

THE FIJIAN AND WESTERN EDUCATION

Today in Fiji the government and the missions share the task of native education, but for nearly a century missions have been the controlling force in education. Here, as in most other places in the world, there seems to be an urgent need for a recasting of the curriculum so that what is taught will bear more fully upon the life-interests of the individual (17). The admission is frankly made that attempts to impose the traditional curriculum of a complex European civilization have met with indifferent success.

Furnivall (9) states that " . . . generally successful as a means to gaining acceptance of modern ideas has been the whole field of sport, and more especially team play." Certainly if self-determination is the end sought, the important thing is to provide more occasions

* The statement is Williams' but the italics are ours.

on which the rank and file can take part in democratic procedures. As an illustration, the following is an extract from the textbook on Civics I, an introduction to civics, which is used in native schools (17):

Section 1. What does Government mean?

1. Here is a story:

Some boys wished to play football. Sam had a ball, and Tom had one, too. But Sam hid his ball, so that they would use Tom's. Tom was angry.

When they played, they all wanted to play "forward." There were no "backs." Then they began to quarrel about it. Their game was stopped. They could not agree, so they could not play.

Inosa was the biggest boy. He said, "This is very foolish. We cannot play like this; I will be captain, and you must all do what I say. If you do not, then you shall not play."

They all said, "Yes." So he said, "We shall play with Sam's ball today. Tomorrow we shall play with Tom's ball." He then told each boy where to play. Now the game was good. They won the game.

When Inosa became captain, and made laws, that was GOVERNMENT. You cannot play games without laws, and you cannot play without a leader.

Both governments and missions have, in general, welcomed the spreading popularity of Western sports and games as an important factor of change and adaptation in the lives of the people. The schools have been the main centers at which these sports are learned, although they also fan out from the urban centers at which native players have the advantage of being able to compete with whites (13).

The growing interest of government in promoting sports and games can be traced through an examination of the Annual Colonial Reports (1). The report for 1922 records the fact that the Boy Scout movement had been successfully started in Suva. The report for 1924 states, "Much enthusiasm is shown by the natives in all forms of sport," and gives a record of rugby football competitions among islands within the group as well as with the neighboring islands of Tonga and Samoa. The report of 1933 contains the following statement: "Physical exercises and organized games are part of the curriculum of all registered schools."

An increasing body of administrators, missionaries, and teachers are becoming aware that appreciation of ancestral ceremonies, arts and crafts, and games, should be encouraged along with the new — for their own intrinsic interest and as a means of renewing native self-appreciation and confidence (13). The whole problem of æsthetic and leisure activities offers an important challenge to those concerned with native welfare and education. Such activities are no "frills" but vital phases of cultural adjustment, and the resources of both old and new may well be utilized (13).

THE FIJIAN OF TODAY

A study of Fiji today reveals a social structure, at once feudal

and communal, which has survived in a form fairly intact into the mid-twentieth century despite certain inroads made here and there into the uniformity of the structure as a result of economic changes, the growth of towns, the rapid increase of communications, and many other factors. It reveals something of a talented and virile Pacific people that has eagerly absorbed a Western education first brought to it by the Christian missions, while at the same time proudly and rightly tenacious of its own culture, its own customs, and its own ceremonial (6).

Sir Harry Luke, then Governor of Fiji, writing in his book of reminiscences covering the years 1938-42, warns that the reader unfamiliar with the South Seas may wonder at the regular recurrence in his diary of mention of native ceremonies. Ritual and ceremonial invariably accompany not only official but social visits in the Pacific islands and are an integral and essential part of the pattern of life. The native dances, sports, and games, not only enshrine their forms of artistic self-expression and *joie de vivre,* but form the nucleus of the customs and conventions regulating their highly complex social existence (15).

Eighty percent of the Fijians still live in villages and the production of food for subsistence is still their most important occupation. The laws of the Native Regulations Board have incorporated into the legal code of the colony under British rule regulations which preserve the traditional communal services. Thus a general program of cooperative or communal work for a year is drawn up at annual councils of chiefs in province districts; and arrangements are made for the weeding of roads and village sites, building houses, the collection of money to be used for churches, water supplies, boats, and taxes (5).

Work for the day is still proclaimed by the village crier shortly after sundown, as he walks through the village calling out that the men will work in the village taro plantation, the women will prepare food for district nurses coming to examine the babies, or whatever immediate projects are on hand. Coulter (5) says that Fijian work still preserves its social characteristics; for instance, a dozen men go out to cultivate a communal plot with two spades, they work in turn by twos, while those who are not working lie on the ground and converse.

Athletics among the natives of Fiji are performed with great enthusiasm, but with an informality of organization that attends nearly everything the native does of his own accord.* Apart from the

* We are indebted to Mr. Luther Nichols (staff writer, *San Francisco Chronicle)* who spent most of the year 1946 " . . . wandering around the group," for much of the material used in the description of the Fijian sports and recreational life of today.

organized leagues of the more populous and Europeanized island of Viti Levu, athletic competitions take the form of haphazard "challenge" contests arranged between villages or districts. The organized sport in which the Fijian does indulge is of a community nature; that is, he plays from his earliest years with the team of his particular home town. Young and middle-aged alike play. Equipment is at a premium and has much to do with the unpredictability of sports contests. The public school at Levuka, for instance, had only one badly battered football, which was used by the entire island of Ovalau. The Fijians never train for a particular sport as we do, and never let sports interfere with other recreations.

Today's native Fijian is always potentially, and sometimes actually, a remarkable athlete. He is unusually dexterous with his hands as a result of performing routine tasks of his life that are completely foreign to a white man — plaiting rope from fibres, for instance; husking cocoanuts, which he can do with incredible speed; catching fish with his bare hands in fish traps; and other things he does almost daily in the course of his daily living which develop qualities of quickness and deftness. His feet are hypertrophied — vastly wider and tougher than ours, with calloused soles and muscular, almost prehensile toes. The agility he acquires from climbing over rooted, twisting forest trails and crossing bridges made of a single slippery log, and the strength he derives from such common native labors as toting heavy copra bags all day or working in the gold mines plainly shows on the athletic field. To see a Fijian kick a football squarely with his big bare toe makes a European flinch, but he does so with tremendous leg power and it isn't at all uncommon to see a 40-yard dropkick from a bad angle sail right between the posts.

Nor is football the only sport at which the Fijians excel, though it is best suited to their vigorous all-around physiques. Without any practice to speak of, and running on grass still damp from a rain-squall, a Fijian ran the 100 in 9-⅗ seconds at the annual Sports Day track meet in 1946, timed by British officials.

Both men and women are tall on the average, the males running from 5'8" to well over six feet, and despite—or because of—the hardships they are exposed to as infants and children, which cause a high mortality rate, they are almost invariably good physical specimens. Strong, heavy-jawed, broad-nosed features, thick shoulders and arm muscles, sturdy, muscular legs, and an erect, athletic carriage are Fijian characteristics.

A good deal of this fitness may be attributed to the *mekes* which the native performs whenever there is an excuse for it; an excuse being the visit of a *roko* (chief) from another *koro* (village), a wedding, etc. The dances are long-standing choreographies on some

simple theme, the breaking of surf on barrier reefs, the evening flight of the *beka* (flying foxes) in search of food, or a legendary war party, for example. In out-of-the way areas where tourists have not corrupted the true, handed-down pageant, their "sword-dance" sometimes becomes terrifyingly realistic, a demonstration of what things were like in cannibal days, only more so, what with the added stimuli of pounding lalis (drums) and the choral singing of the women. One also realizes the source of the Fijian's remarkable timing in athletics when he sees them dance through frenzied patterns without ever missing a beat—the timing that enables him to kick a ball with either foot on the dead run, and tackle so surely. One rarely, if ever, sees a Fijian make a miscalculation of the eye, foot, or hand.

In 1939 the Fijian Rugby League rounded up an all-star team (all native) and traveled to New Zealand for the first overseas matches played by representatives of the group. New Zealand boasts some of the world's best football players, and always has. They regularly trounce the Australians to atone for the Aussies' victories over them at cricket. After tieing their first game, against the weakest team in the New Zealand league, the Fijians proceeded to astound "Kiwi" sports fans by winning all of their remaining games, beating soundly both the famous Maori All-Blacks and that year's championship Auckland 15's.

Certainly there is a peculiar intensity about the Fijian at "play" that cannot be entirely attributed to his communal pride or his simplicity of mind. On two occasions football games were broken up by fist-fights on the field at Levuka. The answer may lie in the fact that the Fijian lives very close to the heart of nature, to life and death itself in his rudimentary existence in the islands—much more than certain other peoples with machine-manufactured aids and refinements—and consequently his basic drives are reflected in his approach to sports. For the most part the English teams of the islands flatly refuse to play against *kaisi* (native) teams, not on any racial grounds, but simply because, as they understate it, "they are too rough." Off the athletic field the Fijian is a friendly, happy-go-lucky man and woman, and there is no implication intended that they are not at all times sportsmanlike in their games; they are simply "all out" all the time.

SUMMARY

The Fijians were at one time described as a disgrace to humanity, and among the most degraded of the savages in the Pacific (11). From the perspective of today we know that their civilization was in some respects superior as compared with other groups in the Pacific. They could build better canoes than their neighbors, and

were adept in the arts of dyeing and designing. Their fishing nets were not unlike our own, and they molded pottery using nothing but the hand to throw it into shape.

There is ample evidence that the culture element which we have identified as sports, games, and recreational activities played a vital and indispensible role in maintaining equilibrium in pre-white Fijian society. Such activities were so integrated with the social, economic, and religious life of the people that their discouragement and suppression by the missionaries created problems which have not been completely solved even today. Thompson (24) says the most vital problem in native administration is the preservation and stimulation of that zest for life, that will to power, necessary to psychical and physical health.

Administrators, missionaries, and teachers are becoming increasingly aware of the fact that the problem of aesthetic and leisure activities offers a most important challenge to all those concerned with native welfare and education. While the spreading popularity of Western sports and games has been an important factor of change and adaptation, it is equally important that indigenous activities of this sort be encouraged as a means of renewing native self-appreciation and confidence. Since such activities are vital phases of cultural adjustment (13) the resources of both old and new may well be utilized.

IMPLICATIONS FOR THE PROFESSION

One of the philosophical justifications for the study of primitive peoples is the fact that knowledge of simpler cultures may make clear social facts that are otherwise baffling and not open to demonstration (2). Because the interdependence of culture elements in their functional relationships is so often obscure, it becomes difficult to comprehend how essential may be any one element to any given culture. Thus the culture element in which we are particularly interested, namely games, sports, and recreational activities, while not obviously so vital in our modern civilization as in a primitive society, may be of even greater importance in its functional inter-relationship with other elements. After all, it is not the existence of games, sports, and recreational activities in a culture which is the significant thing, but the function which these activities serve.

The desire for approval and for some form of mastery or superiority is a characteristic to be found in most individuals. Along with this must come an awakening of social interest, an awareness of individuals as being a part of the group, and a willingness to assume a fair share of responsibility for the operation of the group. In providing a mechanism through which such desires may be satisfied in so-

cially sanctioned ways and these essential lessons learned, all forms of sport in which the ideal of playing the game and promoting team spirit is fostered may be used with great effectiveness.

There was no segment of the primitive population not involved in various forms of vigorous muscular activity as a part of their daily pattern of living. The division of labor and responsibility assured such participation on the part of men, women, and children alike. Thus the contribution that such activity made to normal growth and development as well as to maintenance of physical well-being was assured. Further, vigorous games and sports have been looked upon by all students of modern primitive peoples as among the finest morale builders to be found. Under the conditions of modern civilization we have a very different set of circumstances for large masses of the population. Economic pursuits often provide a very minimum of muscular activity, and an abundance of mechanical inventions has made the possession of a high degree of physical strength and endurance seemingly less and less important to the individual.

But is this true? Has modern civilization, modern science, discovered any adequate substitute for such vigorous muscular activity in contributing to the growth and development of individuals during the first quarter of their anticipated three-score years and ten?

If the individual has been deprived to a large extent of the natural opportunities for participation in strenuous physical activities, is it not then the obligation of society, through its leadership in physical education and recreation, to aid in meeting the biological needs necessary for optimum growth and development as well as providing opportunity for creativity and self-expression?

The influences which may be brought to bear upon the education of children, youth, and adults through properly organized and conducted programs of games and sports extend beyond mere physical development and are numerous and far reaching. Physical activities, however, are the primary tools, and it is clear that one of the first concerns of programs of games and sports (particularly for youth and adults) must be to provide pleasurable, self-promoting activity aiming at the development of skills, and thereby the acquisition of interests leading to habitual participation in vigorous physical recreation.

Recreation through physical activities, as seen in Fiji, was clearly education of the body, but at the same time it was regarded more fundamentally as a very important part of the general education of all individuals—an education essential to the satisfactory molding of a wide gamut of significant human traits and qualities, education not of but through the physical.

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Doctorate Theses Reported By Graduate Departments of Health, Physical Education and Recreation 1930-1946, Inclusively*

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(Submitted for publication, April, 1947)

IN this study the department title is broadly used as physical education, although it varies in various combinations with health education, health, physical welfare, and recreation.

The list of 420 doctorate theses has been compiled from responses to a letter of inquiry sent to all professional departments of physical education offering graduate work in the United States. The inquiry was sent to the 20 institutions reported by Hewitt[1] as offering the Ph.D. or Ed.D. in 1942-1943; in addition, all 56 offering the master's degree were covered to pick up a few other institutions which have developed a doctorate offering since 1942-1943.[2] The

* This list includes some theses completed in other departments which were partly sponsored or advised upon by one or more staff members in health, physical education, and recreation. Only recently have independent departments for doctorate work been organized in health, physical education, and recreation. To make this plain, one thesis may be cited; the title is *Teacher Education in Physical Education with Special Reference to the Major Programs for Women in Selected State Teachers' Colleges.* This student completed the bachelor's and master's degrees in physical education but the doctorate thesis was developed and sponsored in the school of education rather than in the independent department of physical education; however a member of the latter department served on the committee and the student is legitimately considered a physical education student who carried the professional interest through the doctorate level under the auspices of another department. Since receiving the doctorate this student has continued to teach physical education. At this same university between 1873 and 1943 there were 92 master's and doctorate theses completed in other departments which in one way or another were connected with the department and personnel of physical education, or were sufficiently meaningful in the implications for affecting the program, philosophy, or scientific basis of physical education to deserve listing. The exact percentage included of such "out-of-the-field" work by other academic departments or professional schools is 21.8 per cent.

** The author wishes to acknowledge the help of Mrs. Jean Curran and Mrs. Marie Hunter in compiling and organizing this material.

1 J. E. Hewitt, "The Doctoral Program in Physical Education," *Research Quarterly*, 17: 82-95 (May, 1946).

2 ———, "The Graduate Major in Physical Education," *Research Quarterly*, 13: 252-256 (May, 1942).

United States Office of Education's *Educational Directory,* Part III, 1946-1947, does not specifically cover the graduate work in physical education, nor do other available sources.[3] Appropriate titles were selected from all these known available sources, including some institutions which offered no graduate work in physical education.

Some 329 of these theses, 78.3 percent, were sponsored by physical education departments, but with the majority of degrees taken in the schools or departments of education, as is true at Columbia and New York Universities. Some 91 other theses, 21.7 percent, were under the auspices of the following named departments which had some special interest in them, either the student being under combination advisement involving the physical education department or a physical education person studying a physical education topic in some other department, such as:

Educational Research	30
Psychology	24
Physiology	6
Sociology	6
Child Welfare	6
Hygiene and Public Health	1
Miscellaneous (not over two in any department)	16
TOTAL	91

The number of Ph.D. theses is 279, 66.4 percent; the number of Ed.D. theses is 139, 33.1 percent; and the number of Dr.P.H. theses is 2, .5 percent. Chart I shows the distribution according to topical emphasis and Chart II shows the distribution according to research methods. Table I and Table II give the detailed breakdown according to institutions for the seven principal kinds of educational emphasis and the eleven methods of research involved.

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3 Several sources presumably list the doctoral theses but none of the sources below were found to be complete with respect to the information summarized in this paper:

(1) *Bibliography of Research Studies in Education.* Washington, D. C.: United States Office of Education. Series began 1926-1927.

(2) *Annual List of Doctoral Dissertations.* Washington, D. C.: Library of Congress, began 1912. Published by the University of Illinois, 1917-1927, and since 1927 as in the source above.

(3) *Doctors' Theses in Education.* Washington, D. C.: United States Office of Education, pamphlet No. 60, 1934, (797 theses available for loan).

(4) D. B. Gilchrist. *Doctoral Dissertations Accepted by American Universities, 1933 to date (annually).* New York: H. W. Wilson and Co. (Vol. I, 1934).

Frequency According to Years.—In a number of instances a thesis involves more than one emphasis or research method. The classification is made according to the principal emphasis and research method used. The frequency of completed theses for each year, 1930 to 1946

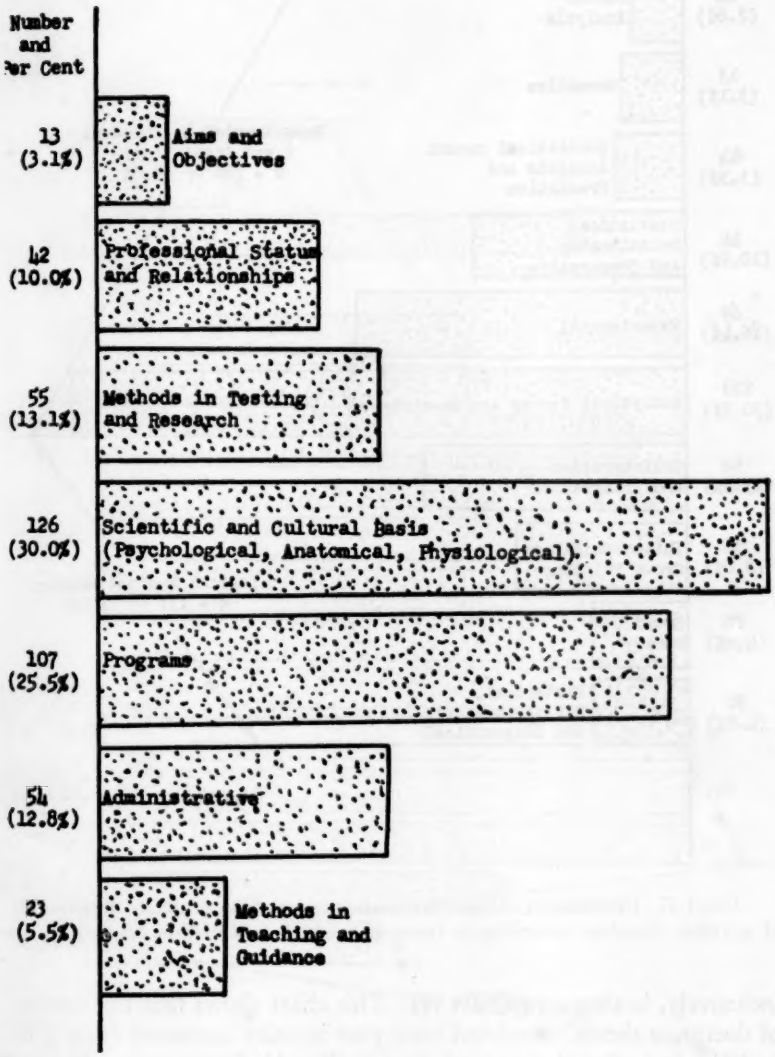

Chart I. Distribution of doctorate theses reported by graduate departments of physical education according to topical emphasis (1930-46 inclusively).

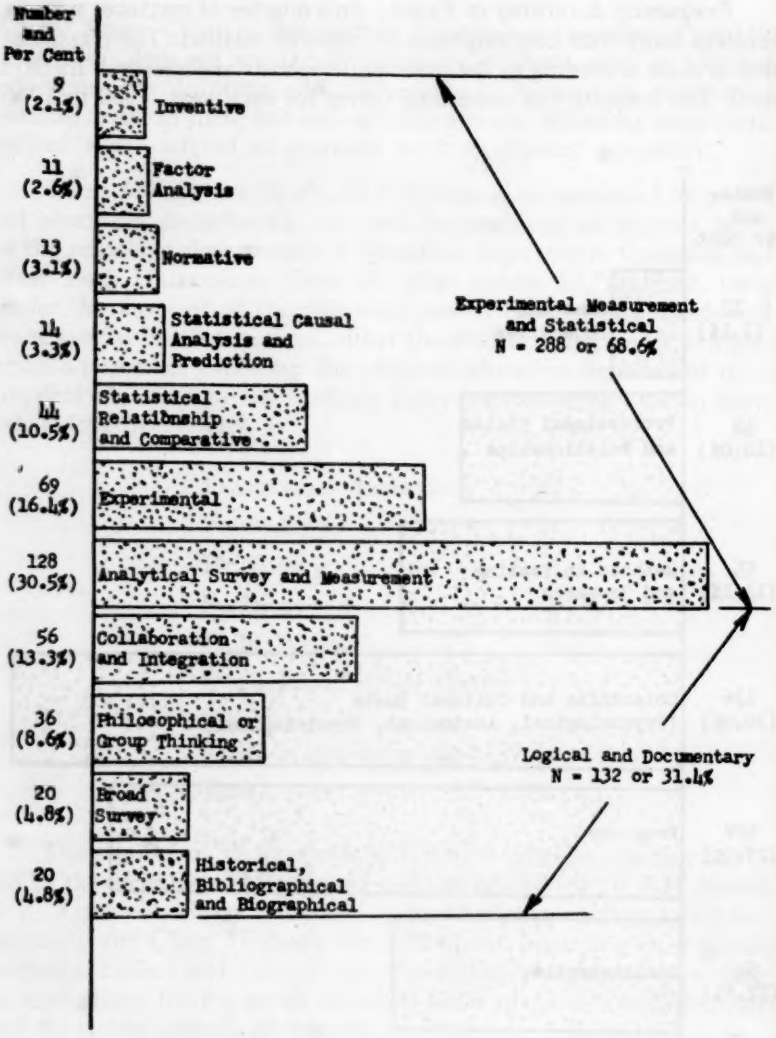

Chart II. Distribution of doctorate theses reported by graduate departments of physical education according to research methods (1930-46 inclusively).

inclusively, is shown in Chart III. This chart shows that the number of doctorate theses completed each year steadily increased from 1930 to 1942, but after the start of World War II dropped sharply from 36 in 1942 to 15 in 1946, covering the span of the war, approximately. Already, from sample reports in hand for 1947, the curve is accelerating upward again.

GENERALIZATIONS

1. Beyond a doubt this field is now heavily involved in a period of scholastic endeavor which will seemingly eclipse all others. Preparation to handle the demand obviously involves increases in staff, facilities, and program at the doctorate level.

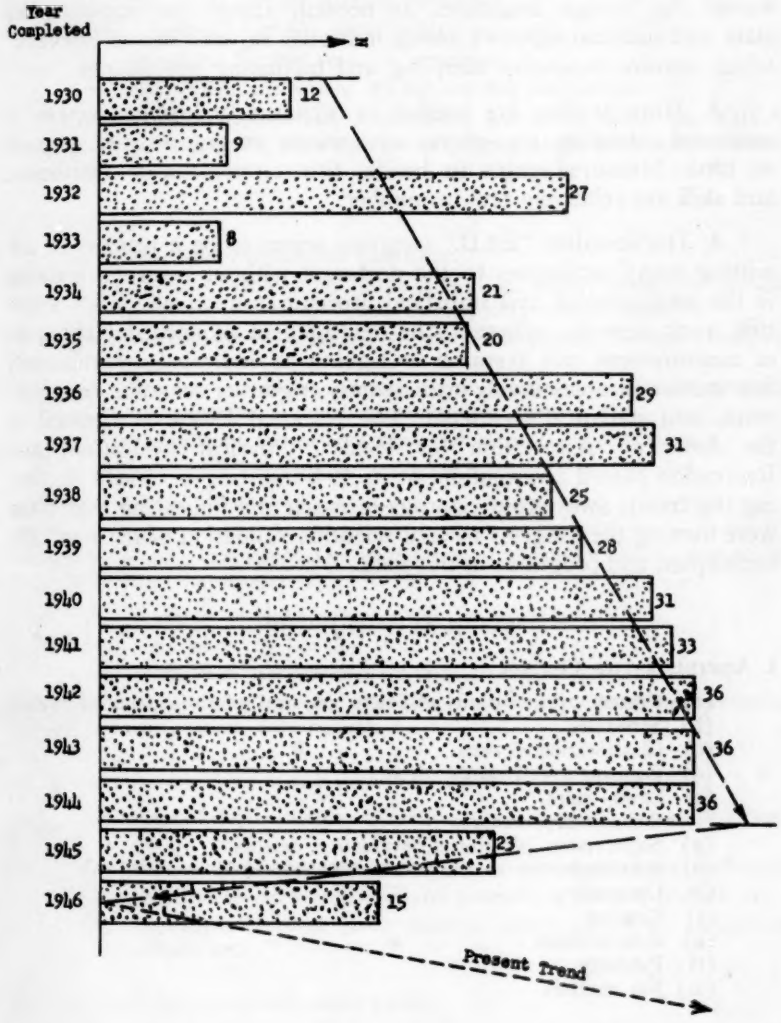

Chart III. Distribution of doctorate theses reported by graduate departments of physical education according to year of completion (1930-46 inclusively).

2. The great number of "Analytical Surveys" needs close examination. These are not as rigorous in scientific methodology as the experimental or historical, for instance, and some of these studies could be further developed by statistical causal analysis and factor analysis. Too many of the "Analytical Surveys" involve measurements of a very routine kind, which are not representative of ingenuity or precision. More rigorous library work, particularly as it involves the foreign languages, is needed. Larger participation by state and national agencies seems indicated in the "Broad Surveys" which involve expensive sampling and tabulating procedures.

3. More studies are needed in which actual *improvement* is measured, showing the effects of various programs over periods of time. Measured gains in health, fitness, personality attributes, and skill are relatively few in number.

4. The so-called "Ed.D." program seems to be a process of admitting many candidates to the doctorate without rigorous training in the measurement and statistical procedures upon which all scientific work depends; whereas, the development of needed techniques of measurement and research is lagging as indicated by relatively few studies in areas involving ingenuity, rigorous scientific measurement, and statistical treatment. The National Research Council of the American Association for Health, Physical Education, and Recreation passed a resolution at its 1947 meeting in Seattle deploring the trends away from rigorous research and indicating that these were hurting the progress toward scientific validation of the methods, techniques, and programs in this field.

TOPICAL EMPHASIS

1. ADMINISTRATIVE CONTROL:
   - (a) Present overall status of health, physical education, and recreation
   - (b) Schedules
   - (c) Classification devices
   - (d) Equipment—standards—design
   - (e) Laws—rules
   - (f) Officiating procedures
   - (g) Supervisory procedures, evaluative devices
   - (h) Administrative measurements and standards
   - (i) Up-grading
   - (j) Grading
   - (k) Requirements
   - (l) Publicity
   - (m) Job analysis

2. PROFESSIONAL STATUS AND RELATIONSHIPS (INCLUDING TEACHER TRAINING):
   - (a) Supply and demand for teachers
   - (b) Salaries
   - (c) Professional status of health and physical education

(d) Preparation (professional training requirements)
(e) Certification requirements
(f) Athletic associations
(g) Professional organizations
(h) The American Association for Health, Physical Education and Recreation
(i) Characteristics of the personnel
(j) Standards for the teaching personnel
(k) Standards for the administrative personnel
(l) Standards for the research personnel
(m) Curriculum analysis in teacher-training institutions
(n) Trends, methods and standards in specialized fields, i.e., YMCA, public schools, private schools, colleges, youth organizations, camping, recreation

3. PROGRAMS:

(a) Service and Professional Curricula:
(1) A course syllabus in health education, safety education, physical activities, recreation—state, county, city, school, camp, etc.
(2) Descriptions of programs in particular schools, foreign countries, etc.
(3) Progressive outlines—various types of classes, i.e., body mechanics, corrective, track and field, swimming, dancing, etc.
(4) Organization of parts of the curriculum
(5) Surveys of interests and attitudes
(b) Informal Recreation

4. METHODS IN TEACHING AND GUIDANCE—EFFICIENCY OF LEARNING OR AMOUNTS OF IMPROVEMENT:

(a) Analysis of skills—pedagogical simplification
(b) Psychology of learning skills
(c) Motivation and learning by testing
(d) Methods in specific activities, i.e., health education, swimming, golf, tennis, dancing, etc.

5. SCIENTIFIC AND CULTURAL BASIS (FACTS AND BASIC PRINCIPLES):

(a) Physiological—circulatory, respiratory, muscular, sensory and nervous.
(b) Psychological—interests, carry-over or mental attributes, motivation
(c) Mechanical—structural size and proportion, growth, posture, etc.
(d) Sociological—moral, group relations, effects on society, civilization, culture, etc.

6. AIMS AND OBJECTIVES—VARIOUS LEVELS:

(a) School: Pre-school, elementary, junior high, senior high, junior college, college, university
(b) Adult: Various groups, sexes, occupations, unemployed, etc.
(c) Organizations: Camps, clubs, movements, etc.

7. METHODS IN TESTING AND RESEARCH:

(a) Anthropometry methods
(b) Laboratory methods
(c) Statistical methods (including applied biometrics)

RESEARCH METHODS

1. *Collaboration and Integration.*—Uses secondary data, bulletins, texts, or library searching, reworks or colligates the material, develops new generalizations without the rigor of statistical analysis, but usually involving careful documentation as to the sources of the original material by accepted bibliographical procedures.

2. *Broad Survey.*—Uses questionnaires, mailing, covers wider geographical scope than can be covered by visitation. Sampling techniques carefully considered.

3. *Analytical Survey and Measurement.*—Uses visitation and case study procedures, usually carefully prepared check lists and interviews. May use measurements or tests to give simple description of characteristics. Includes genetic studies, based upon case-study methods. May apply to individual cases.

4. *Experimental.*—Sets up experimental pattern to control extraneous and disturbing factors to permit study of one selected experimental factor: (a) Single Group Procedure, (b) Parallel Group Procedure, (c) Rotation.

5. *Statistical Relationship and Comparative.*—Uses correlational and graphical procedures to study intercorrelations and comparative trends. Involves descriptive and comparative statistics. Used in the preliminary stages of test construction.

6. *Statistical Causal Analysis and Prediction.*—Uses exact controlled experimentation or inferred statistical analysis through multiple regression analysis and prediction equations of a physical or statistical nature. Used in advanced phases of test construction. Involves superior mathematical treatment.

7. *Historical, Bibliographical, and Biographical.*—Uses library and documentary research techniques, validates source material and testimony, chronological and social emphases and implications.

8. *Inventive.*—Development of new ideas and devices, may take a variety of forms, i.e., mechanical, tests, systems of organization, theoretical explanations, etc.

9. *Philosophical or Group Thinking.*—Controlled thinking procedures derived from logic and experience. Frequently uses committee, jury, or study commission method to evaluate experiences, behavior, or programs, particularly where the results are intangible.

10. *Normative.*—Derives scales for rating achievements, schemes to show individual differences, comparative charts, etc. Also, the development of standards more broadly conceived in terms of "what ought to be," i.e., standards for buildings, equipment, etc., as determined by consensus of a jury.

11. *Factor Analysis.*—Follows a systematic routine known as the Thurstone multiple factor method, determining the factor loadings from a matrix of intercorrelations, rotation according to meaning and prediction of factors. Used in factoring a large group of tests or test items to determine the more fundamental groups or clusters which suggest the primary traits or characteristics.

TABLE I

DISTRIBUTION OF DOCTORATE THESES IN HEALTH, PHYSICAL EDUCATION, AND RECREATION*

Name of Institution (34 Schools)	*Number of Theses*	*Topical Emphasis*						
		Administrative	*Professional Status and Relationships*	*Programs*	*Methods in Teaching and Guidance*	*Scientific and Cultural Basis*	*Aims and Objectives*	*Methods in Testing and Research*
Boston College	1					1		
University of California	4	1				2		1
University of Chicago	6			1		4		1
University of Cincinnati	2	1			1			
Columbia University	96	16	11	34	5	15	6	9
Duke University	1				1			
Fordham University	1			1				
George Washington University	1			1				
George Peabody College for Teachers	4			1	1	2		
Harvard University	4					4		
University of Illinois	5	3	1			1		
Indiana University	11	3				6		2
The State University of Iowa	45		2	8	2	15		18
The Johns Hopkins University	10				1	9		
University of Kansas	2					2		
University of Michigan	13		1	1	2	7		2
University of Minnesota	5					3		2
New York University	146	23	15	46	7	37	5	13
The University of North Carolina	1					1		
Northwestern University	3			2		1		
University of Notre Dame	1					1		
The Ohio State University	6	1	1			3		1
The University of Oklahoma	1	1						
University of Oregon	3		1			2		
The Pennsylvania State College	8		2	3		3		
University of Pennsylvania	2				1	1		
The University of Pittsburgh	13	3	1	5		1	2	1
University of Rochester	2					1		1
The University of Southern California	1					1		
Stanford University	14		7	2	1	1		3
Syracuse University	1	1						
University of Virginia	1			1				
University of Wisconsin	2				1	1		
Yale University	4	1		1		1		1
Totals	420	54	42	107	23	126	13	55

*Only the theses reported as being acceptably identified and classified are reported as checked by the Department of Physical Education or library of each institution. There are possibly some theses which are still not reported. If they do not appear, the institution involved did not report them.

TABLE II

DISTRIBUTION OF DOCTORATE THESES IN HEALTH, PHYSICAL EDUCATION, AND RECREATION

Research Methods

Name of Institution (34 Schools)	*Number of Theses*	*Collaboration and Integration*	*Broad Survey*	*Analytical Survey and Measurement*	*Statistical Relationships and Comparative*	*Experimental*	*Statistical Causal Analysis and Prediction*	*Historical, Bibliographical and Biographical*	*Inventive*	*Philosophical or Group Thinking*	*Factor Analysis*	*Normative*
Boston College	1									1		
University of California	4			2	1	1						
University of Chicago	6	1		2	1	2						
University of Cincinnati	2			1					1			
Columbia University	96	19	4	27	6	6	2	6	1	18	2	5
Duke University	1					1						
Fordham University	1			1								
George Washington University	1	1										
George Peabody College for Teachers	4			1	1	1				1		
Harvard University	4				2	1				1		
University of Illinois	5		1	3		1						
Indiana University	11		1	4	4		1		1			
The State University of Iowa	45	2	1	10	5	11	1	1	3	1	7	3
The Johns Hopkins University	10			1		9						
University of Kansas	2					1				1		
University of Michigan	13			1	4	4	2	2				
University of Minnesota	5				2	3						
New York University	146	22	11	52	15	15	7	6	3	11	1	3
The University of North Carolina	1				1							
Northwestern University	3			1		1		1				
University of Notre Dame	1	1										
The Ohio State University	6	1		2		3						
The University of Oklahoma	1			1								
University of Oregon	3		1				1				1	
The Pennsylvania State College	8	1		5	2							
University of Pennsylvania	2					2						
The University of Pittsburgh	13			7				3		1		2
University of Rochester	2					2						
The University of Southern California	1					1						
Stanford University	14	7	1	3		3						
Syracuse University	1	1										
University of Virginia	1							1				
University of Wisconsin	2			2								
Yale University	4			2		1				1		
Totals	420	56	20	128	44	69	14	20	9	36	11	13

Name	Title	Degree and Date	Topical Emphasis	Research Method
Abernathy, Ruth	A Study of Expenditure and Service in Physical Education; an Analysis of Variables and Suggested Techniques for the Interpretation of Expenditures in Terms of Service in Selected Schools of New York State. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 113.	Ph.D. in Educational Research, 1944	Administrative	Analytical Survey and Measurement
Adams, Louis C.	A Plan for the Development of Postwar Physical Education in Columbia University. Columbia University. Pp. 157.	Ed.D. in Health and Physical Education, 1945	Aims and Objectives	Philosophical or Group Thinking
Adams, Thurston	Motion Pictures in Physical Education; Teaching the Tennis Serve with School-Made Films. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 84.	Ed.D. in Health and Physical Education, 1939	Methods in Teaching and Guidance	Collaboration and Integration
Ainsworth, Dorothy S.	The History of Physical Education in Colleges for Women, as Illustrated by Barnard, Bryn Mawr, Elmira, Goucher, Mills, Mount Holyoke, Radcliffe, Rockford, Smith, Vassar, Wellesley and Wells, Columbia University. New York: A. S. Barnes. Pp. 116.	Ph.D. in Educational Research, 1930	Programs	Historical, Bibliographical, and Biographical
Allard, Lucille E.	A Study of the Leisure Activities of Certain Elementary School Teachers of Long Island. Columbia University. Pp. 117.	Ph.D. in Health and Physical Education in T.C., 1940	Programs	Analytical Survey and Measurement
Allen, Ross L.	Weight Deviation and Health in a College Freshman Group. University of Michigan. Pp. 99.	Dr. P.H. in Hygiene and Public Health, 1936	Methods in Testing and Research	Statistical Causal Analysis and Prediction
Aller, Anne S.	The Rise of State Provisions for Physical Education in the Public Secondary Schools of the United States. University of California. Pp. 241.	Ph.D. in Education, 1935	Administrative	Analytical Survey and Measurement
Altenburg, West J.	A Study of a Method of Measuring Muscle Compressibility. Columbia University. Pp. 61.	Ph.D. in Health and Physical Education in T.C., 1938	Methods in Testing and Research	Inventive
Andrews, George F.	Physical Education for Boys in the Secondary Schools in India; A Critical Study with Suggestions for Reconstruction. Columbia University. Madras: Jupiter Press. Pp. 219.	Ph.D. in Educational Research, 1934	Aims and Objectives	Philosophical or Group Thinking
Anderson, John D.	An Evaluation of Participation in Extracurricular Activities by Secondary School Students. The University of Pittsburgh. Pp. 211.	Ph.D. in Education, 1941	Programs	Analytical Survey and Measurement
Ashbrook, Willard P.	A Method of Selecting Students for Teacher Training in Physical Education. New York University. Pp. 161.	Ph.D. in Education, 1931	Professional Status, and Relationships	Normative
Aulback, Sister M. D.	Health Education Practice in Catholic Elementary Schools: A Study of the Diocese of Brooklyn. Fordham University. Pp. 187.	Ph.D. in Education, 1938	Programs	Analytical Survey and Measurement
Baer, Reuben A.	Relationship Between Rate of Learning and Retention in Several Motor Activities. The Johns Hopkins University. Pp. 113.	Ph.D in Psychology, 1941	Scientific and Cultural Basis	Experimental

Name	Title	Degree and Date	Topical Emphasis	Research Method
Baker, Gertrude M.	A Guide for Teaching Health and Physical Education in the Elementary School. Columbia University. Pp. 143.	Ed.D. in Health and Physical Education, 1946	Programs	Collaboration and Integration
Baker, Mary C.	A Study of Factors Which May Influence the Participation in Physical Education of Girls and Women, Fifteen to Twenty-five. New York University. Pp. 53.	Ed.D. in Education, 1939	Scientific and Cultural Basis	Analytical Survey and Measurement
Barclay, George D.	The Relationship Between Efficient Vision and Certain Sensory Motor Skills. New York University. Pp. 87.	Ph.D. in Education, 1938	Methods in Teaching and Guidance	Statistical Relationship and Comparative
Barker, Gordon H.	Home Recreation. Northwestern University. Pp. 198.	Ph.D. in Sociology, 1940	Programs	Analytical Survey and Measurement
Barton, Helen M.	A Study of the Development of Textbooks in Physiology and Hygiene in the United States. The University of Pittsburgh. Pp. 462.	Ed.D. in Education, 1942	Programs	Historical, Bibliographical, and Biographical
Bass, Ruth I.	An Analysis of the Components of Tests of Semicircular Canal Function and of Static and Dynamic Balance. The State University of Iowa. Pp. 51.	Ph.D. in Physical Education, 1938	Scientific and Cultural Basis	Factor Analysis
Batchelor, Wilbur C.	Changing Conceptions of Leisure and Leisure Education. The University of Pittsburgh. Pp. 113.	Ed.D. in Education, 1936	Aims and Objectives	Philosophical or Group Thinking
Beall, Elizabeth	The Relation of Various Anthropometric Measurements of Selected College Women to Success in Certain Physical Activities. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 68.	Ph.D. in Health and Physical Education in T.C., 1939	Scientific and Cultural Basis	Statistical Relationship and Comparative
Beebe, Elinor L.	Motor Learning of the Child in Balance and in Hand and Eye Coordination as Related to Nutrition. The Johns Hopkins University. Pp. 263.	Ph.D. in Psychology, 1932	Scientific and Cultural Basis	Experimental
Beiswanger, Barbara A.	The Ideational Sources of the Modern Dance in America as Expressed in the Works of Two Leading Exponents, Isadora Duncan and Ruth St. Denis. New York University. Pp. 392.	Ph.D. in Education, 1944	Scientific and Cultural Basis	Collaboration and Integration
Bender, Paul F.	A Study of Some Factors Affecting the Appointment of Prospective Teachers of Physical Education. New York University. Pp. 98.	Ed.D. in Education, 1939	Professional Status and Relationships	Analytical Survey and Measurement
Benkert, Joseph M.	An Appraisal of Health Knowledge in Certain Senior High Schools of Beaver County. The University of Pittsburgh. Pp. 118.	Ph.D. in Physical Education, 1941	Programs	Analytical Survey and Measurement
Benton, Rachel J.	The Measurement of Capacities for Learning Dance Movement Techniques. The State University of Iowa. Pp. 47.	Ph.D. in Physical Education, 1942	Methods in Testing and Research	Statistical Causal Analysis and Prediction
Berry, Roy M.	A Survey and Evaluation of the Work of State Athletic Associations. Stanford University. Pp. 313.	Ed.D. in Education, 1943	Professional Status and Relationships	Analytical Survey and Measurement
Biesanz, John B.	The Youth Hostel. The State University of Iowa. Pp. 283.	Ph.D. in Sociology, 1941	Programs	Analytical Survey and Measurement

Name	Title	Degree and Date	Topical Emphasis	Research Method
Bishop, W. Austin	The Correlation of Blood Counts Body Temperature, and Pulse Rate with Emotional Status. New York University. Pp. 127.	Ph.D. in Education, 1942	Scientific and Cultural Basis	Experimental
Blair, Herbert F.	Certain Physical Education Facilities in Eastern Junior and Senior High Schools, Years 1927 and 1928: Criteria for Gymnasiums, Offices, and Service Rooms. Columbia University. New York: A. S. Barnes. Pp. 174.	Ph.D. in Educational Research, 1938	Administrative	Analytical Survey and Measurement
Blesh, T. Erwin	Evaluative Criteria in Physical Education. Yale University. Pp. 131.	Ph.D. in Education, 1945	Administrative	Philosophical or Group Thinking
Boillin, Mary L.	Determination of the Inter-relations, Partial and Multiple, Between Various Anthropometric Measurements of College Women. Columbia University. Pp. 63.	Ph.D. in Health and Physical Education in T. C., 1930	Methods in Testing and Research	Statistical Causal Analysis and Prediction
Bookwalter, Carolyn W.	A Study of the Relationship Between Stability and Physical Ability of Elementary School Children. Indiana University. Pp. 121.	Ed.D. in Education, 1940	Scientific and Cultural Basis	Statistical Relationship and Comparative
Bookwalter, Karl W.	A Critical Evaluation of the Application of Some of the Existing Means of Classifying Boys for Physical Education Activities with a View to the Determination of an Administratively Plausible Procedure Which Shall Produce More Homogeneous Classification. New York University. Pp. 281.	Ed.D. in Education, 1939	Methods in Testing and Research	Collaboration and Integration
Boone, Elwood	A Study of the Relationship Between Recreational Interest, Intelligence, Scholastic Achievement, Personality, and Vocational Interest. University of Michigan. Pp. 187.	Ph.D. in Education, 1945	Scientific and Cultural Basis	Statistical Relationship and Comparative
Bower, Philip A.	The Relation of Physical, Mental, and Personality Factors to Popularity in Adolescent Boys. University of California. Pp. 140.	Ph.D. in Education, 1941	Scientific and Cultural Basis	Statistical Relationship and Comparative
Boyle, Robert W.	Some observations on the Effects of Exercise on the Blood, Lymph, and Muscle in Its Relation to Muscle Soreness. University of Minnesota. Pp. 178.	Ph.D. in Physiology, 1936	Scientific and Cultural Basis	Experimental
Boynton, Bernice	The Physical Growth of Girls; A Study of the Rhythm of Physical Growth from Anthropometric Measurements on Girls Between Birth and Eighteen Years. The State University of Iowa. Pp. 105.	Ph.D. in Child Welfare, 1936	Scientific and Cultural Basis	Normative
Brainard, Albert F.	A Guide for Men Student Teachers of Physical Education in Secondary Schools. New York University. Pp. 432.	Ed.D. in Education, 1941	Programs	Collaboration and Integration
Breckler, Paul W.	The Organization of Study Material in Physical Education for Junior and Senior High School Boys. The State University of Iowa. Pp. 522.	Ph.D. in Physical Education, 1943	Programs	Collaboration and Integration
Brinley, Eldon D.	The Recreational Life of the Mormon People. New York University. Pp. 264.	Ed.D. in Education, 1943	Programs	Analytical Survey and Measurement

Name	Title	Degree and Date	Topical Emphasis	Research Method
Brock, John D.	A Study of Some Psychological Traits of Physical Education Students and Their Relation to Achievement. New York University. Pp. 95.	Ph.D. in Education, 1939	Professional Status and Relationships	Analytical Survey and Measurement
Brown, Hubert E.	A Study of Safety in New York City Elementary and Junior High Schools of New York City. New York University. Pp. 228.	Ph.D. in Education, 1940	Programs	Analytical Survey and Measurement
Byrd, Oliver E.	The Study and Measurement of Health Attitudes. Stanford University. Pp. 332.	Ed.D. in Physical Education, 1940	Methods in Testing and Research	Experimental
Burley, Lloyd R.	A Study of the Recreation Time of Physically Trained Men. The State University of Iowa. Pp. 29.	Ph.D. in Physical Education, 1940	Programs	Analytical Survey and Measurement
Burpee, Royal H.	Seven Quickly Administered Tests of Physical Capacity and Their Use in Detecting Physical Incapacity for Motor Activity in Men and Boys. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 151.	Ph.D. in Educational Research, 1940	Methods in Testing and Research	Analytical Survey and Measurement
Burts, Mary F.	Factors Associated with Juvenile Delinquency. New York University. Pp. 75.	Ph.D. in Education, 1939	Scientific and Cultural Basis	Analytical Survey and Measurement
Buswell, Marian M.	A Manual of Girls' Physical Education for Small High Schools. New York University. Pp. 82.	Ed.D. in Education, 1943	Programs	Collaboration and Integration
Butler, Louis C.	The Evaluation of the Professional Preparation for Leadership in Physical Education in the Secondary Schools of New Mexico. New York University. Pp. 126.	Ed.D. in Education, 1943	Professional Status and Relationships	Normative
Buxton, Claude E.	The Application of Multiple Factorial Methods to the Study of Motor Ability. The State University of Iowa. Pp. 29.	Ph.D. in Psychology, 1938	Methods in Testing and Research	Factor Analysis
Cabot, Phillippe S. De. Q.	The Relationship Between Characteristics of Personality and Physique in Adolescents. Harvard University. Pp. 231.	Ph.D. in Philosophy and Psychology, 1936	Scientific and Cultural Basis	Statistical Relationship and Comparative
Cahn, L. Joseph	Contributions of Plato to Thought on Physical Education, Health, and Recreation. New York University. Pp. 357.	Ed.D. in Education, 1942	Aims and Objectives	Collaboration and Integration
Campbell, Laurie E.	The Administration of the Physical Education Activity Area in Professional Physical Education. New York University. Pp. 152.	Ed.D. in Education, 1943	Professional Status Training, and Relationships	Analytical Survey and Measurement
Carleton, Blondel H.	Studies in the Metabolism and Excitability of Muscle. University of Rochester. Pp. 175.	Ph.D. in Physiology, 1935	Scientific and Cultural Basis	Experimental
Carpenter, Aileen	A Critical Study of the Factors Determining Effective Strength Tests for College Women. The State University of Iowa. Pp. 32.	Ph.D. in Physical Education, 1939	Methods in Testing and Research	Factor Analysis
Carr, Martha G.	The Relationship Between Success in Physical Education and Selected Attitudes Expressed by High School Freshman Girls. Indiana University. Pp. 127.	Ed.D. in Education, 1944	Scientific and Cultural Basis	Statistical Relationship and Comparative

Name	Title	Degree and Date	Topical Emphasis	Research Method
Cassidy, Rosalind F.	A Plan to Serve as a Guide in the Reorganization of the Physical Education Program for Students at Mills College, Oakland, California. Columbia University. Pp. 303.	Ed.D. in Education, 1937	Aims and Objectives	Philosophical or Group Thinking
Cavins, Harold M.	The Rise of the National Voluntary Health Agency in the United States. Stanford University. Pp. 282.	Ed.D. in Physical Education, 1941	Professional Status and Relationships	Collaboration and Integration
Chang, Fletcher Yung	State Organization and Administration of Health and Physical Education; an Analytical Study of the Program of Health and Physical Education with Special Reference to Fifteen State Departments of Education. Columbia University. Pp. 253.	Ph.D. in Educational Research, 1932	Administrative	Analytical Survey and Measurement
Chang, Hwei Lan	A Colligation of Facts and Principles Basic to Sound Curriculum Construction for Physical Education in China. The State University of Iowa. Pp. 99.	Ph.D. in Physical Education, 1944	Programs	Collaboration and Integration
Chin, Shuyung	Relationship Between Certain High School Subjects and the Out-of-School Activity of the Students. Columbia University. Pp. 99.	Ph.D. in Health and Physical Education in T.C., 1934	Programs	Statistical Relationship and Comparative
Christianson, Helen	Bodily Rhythmic Movements of Young Children in Relation to Rhythm in Music. Columbia University. Pp. 196.	Ph.D. in Health and Physical Education in T.C., 1939	Scientific and Cultural Basis	Statistical Relationship and Comparative
Clarke, H. Harrison	The Application of Measurement to Physical Education Programs in Secondary Schools. Syracuse University. Pp. 331.	Ed.D. in Education, 1940	Administrative	Collaboration and Integration
Cobb, Louise S.	The Functions of Physical Education in Higher Education. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 192.	Ph.D. in Educational Research, 1943	Professional Status and Relationships	Philosophical or Group Thinking
Cockrell, Dura L.	The Relative Value of Selective Play Material for Pre-School Children: A Study of Play of Pre-School Age by an Unobserved Observer. Yale University. Pp. 157.	Ph.D. in Education, 1933	Programs	Analytical Survey and Measurement
Coffey, J. Russel	A Study of Safety Education Programs of Selected Public High Schools of Ohio. New York University. Pp. 169.	Ed.D. in Education, 1944	Programs	Analytical Survey and Measurement
Cole, Florence B.	The Presentation of a Games Manual for the Rural Elementary Schools of the Southern Appalachian Mountain Section. New York University. Pp. 179.	Ed.D. in Education, 1944	Programs	Collaboration and Integration
Collier, Dorothy	A Psychological Analysis of the Leisure-Time Activities of Some Individuals of Normal and Some of Pre-Psychotic Personality. New York University. Pp. 133.	Ph.D. in Education, 1936	Programs	Analytical Survey and Measurement
Cooper, Bernice I.	The Establishment of General Motor Capacity Tests for High School Girls. The State University of Iowa. Pp. 41.	Ph.D. in Physical Education, 1941	Methods in Testing and Research	Statistical Relationship and Comparative
Cooper, John A.	The Effect of Participation in Athletics upon Scholarship Measured by Achievement Tests. The Pennsylvania State College. Pp. 120.	Ed.D. in Education and Psychology, 1932	Scientific and Cultural Basis	Statistical Relationship and Comparative

Name	Title	Degree and Date	Topical Emphasis	Research Method
Coops, Helen L.	High School Standards in Girls' Athletics in the State of Ohio. Columbia University. Pp. 91.	Ph.D. in Health and Physical Education in T.C., 1933	Administrative	Normative
Copp, Harold	The Effect of a Course in Training and Relaxation on the Progress of Acquisition of Motor Skill. University of Michigan. Pp. 163.	Ph.D. in Education, 1940	Methods in Teaching and Guidance	Experimental
Corbin, Hyman D.	A Comparative Study of Public Recreation in Cities of 300,000 Population and Over with Special Emphasis on New York City. New York University. Pp. 174.	Ph.D. in Education, 1946	Programs	Broad Survey
Cotteral, Bonnie	Principles of Procedures for Guiding Growth in Experiences Involving Physical Education. Columbia University. Pp. 287.	Ed.D. in Health and Physical Education, 1944	Methods in Teaching and Guidance	Collaboration and Integration
Cotteral, Donnie	In Quest of Full Stature as an American Youth. Columbia University. Pp. 279.	Ed.D. in Health and Physical Education, 1945	Aims and Objectives	Philosophical or Group Thinking
Cottrell, Elmer B.	Standards for Selection of Persons to be Trained for Placement in Health and Physical Education. The University of Pittsburgh. Pp. 211.	Ed.D. in Physical Education, 1936	Professional Status and Relationships	Normative
Cottrell, Helene L.	Principles and Methods for Organizing School Programs in Safety Education. New York University. Pp. 540.	Ed.D. in Education, 1942	Aims and Objectives	Broad Survey
Cowell, Charles C.	A Study of Differentials in Junior High School Boys Based on the Observation of Physical Education Activities. New York University. Pp. 164.	Ph.D. in Physical Education and Health, 1935	Scientific and Cultural Basis	Analytical Survey and Measurement
Craine, Henry C.	Methods of Teaching Athletic Skills with Particular Reference to Boys of Junior High School Age. New York University. Pp. 253.	Ed.D. in Education, 1941	Methods in Teaching and Guidance	Analytical Survey and Measurement
Crapser, A. Lester	The Establishment of National Physical Achievement Standards in Certain Physical Education Events for Boys. New York University. Pp. 281.	Ph.D. in Education, 1933	Methods in Testing and Research	Analytical Survey and Measurement
Crissy, William J. E.	Physical Indices of Pubescence and Their Relation to Measured Aspects of Personal and Social Adjustment. The University of North Carolina. Pp. 171.	Ph.D. in Education, 1942	Scientific and Cultural Basis	Statistical Relationship and Comparative
Cross, Hildreth M.	The Motor Capacities of Stutterers. The State University of Iowa. Pp. 66.	Ph.D. in Speech Pathology, 1934	Scientific and Cultural Basis	Experimental
Cunningham, Glen V.	The Relation of Selected Cardiovascular and Strength Measures to Physical Fitness. New York University. Pp. 65.	Ph.D. in Physical Education and Health, 1939	Scientific and Cultural Basis	Statistical Relationship and Comparative
Cureton, Thomas K., Jr.	Standards for Testing Beginning Swimming. Columbia University. Pp. 190.	Ph.D. in Educational Research in T.C., 1939	Methods in Testing and Research	Statistical Causal Analysis and Prediction
Curtis, Lera B.	The Critical Evaluation of the Physical Education Program in the Rural Schools of Michigan. New York University. Pp. 190.	Ph.D. in Physical Education and Health, 1938	Administrative	Analytical Survey and Measurement

Name	Title	Degree and Date	Topical Emphasis	Research Method
Dambach, John	Physical Education in Germany. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 116.	Ph.D. in Educational Research, 1937	Programs	Collaboration and Integration
Danford, Howard G.	The Organization and Administration of a Program of Public School Safety Education. New York University. Pp. 575.	Ed.D. in Physical Education and Health, 1943	Programs	Collaboration and Integration
Daniels, Arthur S.	Guide to Physical Training and Athletics (Army Air Force Technical Training Command). Columbia University. Pp. 159.	Ed.D. in Health and Physical Education, 1942	Programs	Collaboration and Integration
Daniels, Dorothea A.	Organization and Administration of a Two-and-a-Half-Year Nursing Curriculum; Analysis of the Present Nursing Courses at the Beth Israel Hospital School of Nursing. New York University. Pp. 234.	Ed.D. in Physical Education and Health, 1945	Programs	Collaboration and Integration
Davis, Elwood C.	Methods and Techniques Used in Surveying Health and Physical Education in City Schools. New York: Bureau of Publications, Columbia University. Pp. 162.	Ph.D. in Educational Research, 1932	Methods in Testing and Research	Analytical Survey and Measurement
Davis, George E.	The Prevalence of Hobbies and Their Educational Significance. The State University of Iowa. Pp. 511.	Ph.D. in Education, 1937	Programs	Analytical Survey and Measurement
De Girolamo, Harry J.	A Study of the Present Status of the Health and Physical Education Program in the Junior Colleges. New York University. Pp. 174.	Ed.D. in Physical Education and Health, 1945	Administrative	Broad Survey
De Groot, Dudley S.	A History of Physical Education in California (1848-1939). Stanford University. Pp. 623.	Ed.D. in Physical Education, 1940	Professional Status and Relationships	Collaboration and Integration
D'Eliscu, Francois	A Manual in the Organization and Conduct of a Conditioning Program for Physical and Military Fitness and for Combat Training. New York University. Pp. 215.	Ed.D. in Physical Education and Health, 1944	Programs	Collaboration and Integration
Dennis, Edith L.	The Genesis and Development of the American Red Cross and Water Safety Service. New York University. Pp. 268.	Ph.D. in Education, 1943	Programs	Historical, Bibliographical, and Biographical
Derryberry, Carley M.	Social and Economic Factors Associated with Health Protection for the Pre-School Child. New York University. Pp. 141.	Ph.D. in Education, 1933	Scientific and Cultural Basis	Statistical Relationship and Comparative
Desgrey, Arthur H.	A Safety Manual for Campers. New York University. Pp. 181.	Ed.D. in Education, 1945	Programs	Broad Survey
Di Giovanna, Vincent G.	The Relation of Selected Structural and Functional Measures to Success in College Athletics. New York University. Pp. 175.	Ph.D. in Physical Education and Health, 1942	Scientific and Cultural Basis	Statistical Causal Analysis and Prediction
Dixon, Maloise	Physical Education in the Elementary Curricula of the Pennsylvania State Teachers Colleges. The Pennsylvania State College. Pp. 356.	Ed.D. in Physical Education and Education, 1945	Programs	Analytical Survey and Measurement
Djorop, Harold E.	The Effect of Two Methods in Physical Education on Personality Adjustment. New York University. Pp. 118.	Ph.D. in Education, 1943	Scientific and Cultural Basis	Experimental

Name	Title	Degree and Date	Topical Emphasis	Research Method
Dome, Arthur E.	Objectives of Physical Education in the Young Men's Christian Association. New York University. Pp. 234.	Ed.D. in Education, 1937	Aims and Objectives	Broad Survey
Donn, Henry F.	The Content for a Course of Study in Personal Hygiene for the First-Year Boys of the Weequahic Public High School. New York University. Pp. 239.	Ed.D. in Education, 1943	Programs	Analytical Survey and Measurement
Dorgan, Ethel J.	Luther Halsey Gulick, 1865-1918. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 180.	Ph.D. in Educational Research, 1934	Professional Status and Relationships	Historical, Bibliographical, and Biographical
Doyle, Sister Mary P.	A Study of Play Selection in Women's Colleges. Columbia University. Pp. 75.	Ph.D. in Health and Physical Education in T.C., 1935	Programs	Analytical Survey and Measurement
Dreiser, M. Vera	A Study of Health, Physical Education, and Recreation Programs for Women in Municipally Owned Colleges and Universities in the United States of America. New York University. Pp. 97.	Ed.D. in Education, 1944	Programs	Analytical Survey and Measurement
Dresser, Henry O.	A Manual for Golf Instruction. New York University. Pp. 120.	Ed.D. in Education, 1937	Programs	Collaboration and Integration
Drew, A. Gwendolyn	A Historical Study of the Concern of the Federal Government for the Physical Fitness of Non-Age Youth with References to the Schools, 1790-1941. The University of Pittsburgh. Pp. 168.	Ph.D. in Education, 1944	Administrative	Historical, Bibliographical, and Biographical
DuBois, Goddard	The Relationship Between the Posterior View Contour of the Human Body and the Bilateral Alignment of Its Skeletal Framework. New York University. Pp. 135.	Ph.D. in Education, 1940	Scientific and Cultural Basis	Statistical Relationship and Comparative
Duggan, Anne S.	A Comparative Study of Undergraduate Women Majors and Non-Majors in Physical Education with Respect to Certain Personal Traits. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 117.	Ph.D. in Educational Research, 1936	Scientific and Cultural Basis	Statistical Relationship and Comparative
Dulles, Foster R.	America Learns to Play: A History of Popular Recreation. Columbia University. Pp. 441. (Also published in book form by D. Appleton-Century-Crofts, 1940.)	Ph.D. in Sociology, 1940	Programs	Historical, Bibliographical, and Biographical
Dunlap, Sarah C.	The Effect of Voluntary Activity on the Knee-Jerk. The John Hopkins University. Pp. 101.	Ph.D. in Psychology, 1934	Scientific and Cultural Basis	Experimental
Duvall, Ellen N.	The Relation of Rotation to Lateral Deviation in the Spinal Column in the Human Being. New York University. Pp. 114.	Ph.D. in Education, 1944	Scientific and Cultural Basis	Statistical Relationship and Comparative
Eastwood, Floyd R.	Safety in College Physical Education. New York University. Pp. 505.	Ph.D. in Education, 1936	Programs	Broad Survey
Eberhardt, Charles J.	The Relation of Certain Measurements to Ability in an Athletic Sport Involving Sustained Physical Effort. New York University. Pp. 159.	Ph.D. in Education, 1943	Scientific and Cultural Basis	Statistical Causal Analysis and Prediction

Name	Title	Degree and Date	Topical Emphasis	Research Method
Edgerton, Avis E.	Health Claims in Advertising with Special Reference to Certain Women Consumers' Beliefs. New York University. Pp. 161.	Ph.D. in Physical Education and Health, 1938	Programs	Analytical Survey and Measurement
Edgren, Harry D.	An Orientation in Recreation for Secondary School Youth. New York University. Pp. 104.	Ed.D. in Education, 1944	Professional Status and Relationships	Analytical Survey and Measurement
Edwards, Seth J.	An Educational Program of Physical Education for Schools and Colleges of the United Provinces, Agra and Oudh, India. New York University. Pp. 203.	Ph.D. in Education, 1931	Programs	Collaboration and Integration
Ehrlich, Gerald	The Relation Between the Learning of a Motor Skill and Measures of Strength, Motor Ability, Motor Educability, and Motor Capacity. New York University. Pp. 155.	Ph.D. in Education, 1942	Methods in Teaching and Guidance	Statistical Relationship and Comparative
Eigler, Pauline O.	The Effect of Unusual Stimulation on Motor Coordination in Children. The Johns Hopkins University. Pp. 136.	Ph.D. in Education, 1932	Scientific and Cultural Basis	Experimental
Elbel, Edwin R.	A Study of Response Time Before and After Strenuous Exercise. The State University of Iowa. Pp. 87.	Ph.D. in Physical Education, 1938	Scientific and Cultural Basis	Experimental
Elmott, Charlotte D.	The Development of a Mental Hygiene Program in the Santa Barbara City Schools. Stanford University. Pp. 253.	Ed.D. in Physical Education, 1944	Methods in Teaching and Guidance	Experimental
Espenschade, Anna S.	A Study of Motor Performance in Adolescence. University of California. Pp. 346.	Ph.D. in Psychology, 1939	Scientific and Cultural Basis	Experimental
Esslinger, Arthur A.	A Philosophical Study of Principles for Selecting Activities in Physical Education. The State University of Iowa. Pp. 148.	Ph.D. in Physical Education, 1938	Programs	Philosophical or Group Thinking
Estabrooks, Edward C.	Safety and Health Instruction and Practices in School Shops. The Pennsylvania State College. Pp. 221.	Ed.D. in Industrial Education, 1939	Programs	Collaboration and Integration
Ferguson, Ernest V. Jr.	Governmental Participation in Recreation in Response to the War Emergency. New York University. Pp. 191.	Ed.D. in Education, 1945	Programs	Analytical Survey and Measurement
Ferguson, Thomas C.	The Improvement of the Physical Education Program in the County Schools of Maryland. The George Washington University. Pp. 364.	Ed.D. in Education, 1941	Programs	Collaboration and Integration
Flack, Howard W.	Totalitarianism and Physical Education. George Peabody College for Teachers. Pp. 233.	Ph.D. in Physical Education, 1941	Scientific and Cultural Basis	Philosophical or Group Thinking
Fouracre, Maurice H.	The Relationship Between the Advent of Menstruation and the Degree of Physical Development in Adolescent Girls. University of Michigan. Pp. 139.	Ph.D. in Education, 1942	Scientific and Cultural Basis	Statistical Relationship and Comparative
Fox, John F., Jr.	Leisure-Time Interests and Activities of the School Children of Millburn Township, New Jersey. New York University. Pp. 668.	Ph.D. in Education, 1936	Programs	Analytical Survey and Measurement
Fraley, Lester M.	A Comparison of the General Athletic Ability of White and Negro Men of College Age. George Peabody College for Teachers. Pp. 151.	Ph.D. in Physical Education, 1940	Scientific and Cultural Basis	Statistical Relationship and Comparative

Name	Title	Degree and Date	Topical Emphasis	Research Method
Frankel, Ruth R.	The Evaluation of a Program of Dental Health Education by Correction Achieved. New York University. Pp. 190.	Ph.D. in Education, 1940	Administrative	Philosophical or Group Thinking
Frederick, Pauline M.	A Study of the Requirements for the Master's Degree for Women Students Majoring in Physical Education at Teachers College, Columbia University. Pp. 169.	Ed.D. in Health and Physical Education, 1938	Professional Status and Relationships	Philosophical or Group Thinking
Fredericks, J. Wynn	Gaps, Overlappings, and Other Weaknesses in Undergraduate Professional Training in Physical Education as Experienced in Practical Situations. The Pennsylvania State College. Pp. 194.	Ed.D. in Physical Education, 1940	Professional Status and Relationships	Analytical Survey and Measurement
French, Esther L.	The Construction of Knowledge Tests in Selected Courses in Physical Education. The State University of Iowa. Pp. 30.	Ph.D. in Physical Education, 1942	Methods in Testing and Research	Inventive
Fry, Vera	Cost Analysis of Student Field Experience in Public Health Nursing. New York University. Pp. 58.	Ed.D. in Education, 1946	Administrative	Analytical Survey and Measurement
Fryer, Lorine P.	Women and Leisure, A Study of Social Waste. Columbia University. Pp. 141.	Ph.D. in Health and Physical Education, 1942	Programs	Philosophical or Group Thinking
Gabrielsen, Milton A.	Changes in Acid Concentration of the Gastric Content of Man Upon Exposure to Certain Controlled Temperature Conditions. New York University. Pp. 71.	Ph.D. in Education, 1946	Scientific and Cultural Basis	Experimental
Galligan, Glendon E.	A Critical Analysis of Certain Current Practices in Athletics for Men in State Teachers Colleges. New York University. Pp. 285.	Ed.D. in Education, 1937	Administrative	Analytical Survey and Measurement
Geisel, Horace	An Analysis of Health Needs as a Basis for the Reorganization of the Health Program of the Johns Hopkins High School. The Pennsylvania State College. Pp. 88.	Ed.D. in Education, 1943	Programs	Analytical Survey and Measurement
Gerrish, Paul H.	A Dynamic Analysis of the Standing Vertical Jump. Columbia University. Pp. 31.	Ph.D. in Health and Physical Education, 1934	Scientific and Cultural Basis	Experimental
Glascock, David A.	The Status of Health and Physical Education in the High Schools of Indiana. Indiana University. Pp. 337.	Ed.D. in Education, 1937	Administrative	Broad Survey
Gloss, George M.	The Formulation of an Improved Recreational Program for the Industrial City of Bayonne, New Jersey. Columbia University. Pp. 135.	Ed.D. in Health and Physical Education in T.C., 1937	Programs	Philosophical or Group Thinking
Goss, George E.	The Development of Organized Physical Education in the Philippine Islands. New York University. Pp. 170.	Ph.D. in Education, 1932	Programs	Analytical Survey and Measurement
Gowen, G. Howard	Analysis and Appraisal of Public Health Department of La Salle, Peru and Oglesby. University of Illinois. Pp. 52.	Ph.D. in Bacteriology, 1937	Administrative	Analytical Survey and Measurement
Gray, Miriam M.	Windows to Physical Education. Columbia University. Pp. 211.	Ed.D. in Health and Physical Education, 1943	Programs	Philosophical or Group Thinking

Name	Title	Degree and Date	Topical Emphasis	Research Method
Graybeal, Elizabeth	The Measurement of Outcomes of Physical Education for College Women. University of Minnesota. Pp. 80.	Ph.D. in Education, 1934	Scientific and Cultural Basis	Statistical Relationship and Comparative
Grimshaw, William M.	The Administration of Day Camps in the United States. New York University. Pp. 167.	Ed.D. in Education, 1941	Administrative	Broad Survey
Guiot, Germaine C.	Supervising Student Teaching in Physical Education. New York University. Pp. 143.	Ed.D. in Education, 1941	Administrative	Analytical Survey and Measurement
Gutteridge, Mary V.	A Study of Motor Achievement of Young Children. Columbia University. Pp. 178.	Ph.D. in Health and Physical Education in T.C., 1940	Scientific and Cultural Basis	Analytical Survey and Measurement
Haar, Franklin	Degrees of Interest Expressed by High School Boys in Health Subject Matter. The University of Pittsburgh. Pp. 131.	Ph.D. in Education, 1946	Programs	Analytical Survey and Measurement
Haggerty, Helen R.	Certain Factors in the Professional Education of Women Teachers of Physical Education. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 87.	Ph.D. in Educational Research, 1938	Professional Status and Relationships	Collaboration and Integration
Hagman, Ellen P.	The New York State War Council Program of Physical Fitness for Girls and Women. Columbia University. Pp. 138.	Ed.D. in Health and Physical Education, 1943	Programs	Collaboration and Integration
Haight, Edith C.	Individual Differences in Motor Adaptations to Rhythmic Stimuli. New York University. Pp. 152.	Ph.D. in Education, 1944	Scientific and Cultural Basis	Experimental
Hall, Marguerite F.	Description and Prediction of Physical Development in School Boys. University of Michigan. Pp. 245.	Ph.D. in Education, 1934	Methods in Testing and Research	Statistical Causal Analysis and Prediction
Halsey, Elizabeth	The Development of Public Recreation in the Metropolitan Area of Chicago. University of Michigan. Pp. 489.	Ph.D. in Education, 1939	Programs	Historical, Bibliographical, and Biographical
Hardy, Elvin R.	A Further Validity of the Pulse-Ratio Test as a Measurement of Physical Efficiency and Endurance. The State University of Iowa. Pp. 39.	Ph.D. in Physical Education, 1937	Methods in Testing and Research	Experimental
Harmon, John M.	Methods of Procedure in the City Comprehensive School Health and Physical Education Survey. Indiana University. Pp. 197.	Ed.D. in Education, 1932	Methods in Testing and Research	Analytical Survey and Measurement
Harnett, Arthur L.	A Plan for Further Development of the Columbia College Program for Navy V-12 Physical Training. Columbia University. Pp. 137.	Ed.D. in Health and Physical Education, 1944	Programs	Philosophical or Group Thinking
Harrison, Ellwood R.	Personal Tempo and the Interrelationships of Voluntary and Maximal Rates of Movement. The Johns Hopkins University. Pp. 70.	Ph.D. in Psychology, 1938	Scientific and Cultural Basis	Experimental
Hart, Charles J.	Guides for the Construction of a Curriculum for Training Men Majoring in Physical Education. New York University. Pp. 347.	Ed.D. in Education, 1945	Professional Status and Relationships	Analytical Survey and Measurement
Hatlestad, S. L.	The Determination and Measurement of Body Build in College Women. The State University of Iowa. Pp. 59.	Ph.D. in Physical Education, 1940	Methods in Testing and Research	Normative

Name	Title	Degree and Date	Topical Emphasis	Research Method
Hawkins, Charles C.	The Effects of Conditioning and Training Upon the Differential White Cell Count. New York University.	Ph.D. in Education, 1937	Scientific and Cultural Basis	Experimental
Heaton, Kenneth L.	A Study of the Recreational Life of High School Students. University of Chicago. Pp. 285.	Ph.D. in Divinity, 1931	Programs	Analytical Survey and Measurement
Henley, Eugene H.	Factors Related to Muscular Tension. Columbia University. Pp. 44.	Ph.D. in Health and Physical Education in T.C., 1936	Scientific and Cultural Basis	Experimental
Hepp, Frank	Unitary Factors in Character. The State University of Iowa. Pp. 55.	Ph.D. in Physical Education, 1937	Scientific and Cultural Basis	Factor Analysis
Hewitt, Jack E.	An Analysis of Graduate Offerings Leading to the Master's and Doctor's Degrees in Physical Education Institutions of Higher Learning of the United States. University of Oregon. Pp. 189.	Ed.D. in Education, 1943	Professional Status and Relationships	Broad Survey
Hindman, Darwin A.	An Approach to the Construction of a Teacher-Training Curriculum in Physical Education. The Ohio State University. Pp. 297.	Ph.D. in Physical Education, 1935	Professional Status and Relationships	Collaboration and Integration
Hoffer, Joe R.	An Activity Analysis of the Duties of Recreation and Informal Education Leaders and Supervisors. The Ohio State University. Pp. 90.	Ph.D. in Social Administration, 1942	Administrative	Analytical Survey and Measurement
Hoffman, Frances P.	A Study of Street Accidents Occurring to Children 16 Years of Age and Under in Manhattan Borough of New York City. New York University. Pp. 56.	Ph.D. in Education, 1944	Programs	Analytical Survey and Measurement
Holliman, Jennie	American Sports (1785-1835). Columbia University. Pp. 222.	Ph.D. in Health and Physical Education, 1931	Programs	Historical, Bibliographical, and Biographical
Horton, Clifford E.	A Study of Physical Sex Differences and Motor Performance Differences of Central Illinois Boys and Girls. Indiana University. Pp. 208.	Ed.D. in Education, 1942	Scientific and Cultural Basis	Statistical Relationship and Comparative
House, Howard H.	A Study of the Standing High Kick as a Test of Motor Ability. New York University. Pp. 109.	Ph.D. in Education, 1936	Scientific and Cultural Basis	Statistical Relationship and Comparative
Howard, Glenn W.	A Measurement of the Achievement in Motor Skills of College Men in the Game Situation of Basketball. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 109.	Ph.D. in Educational Research, 1937	Methods in Testing and Research	Experimental
Howland, Amy R.	The Establishment of National Achievement Standards for Girls in Specific Physical Education Activities. New York University. Pp. 237.	Ph.D. in Education, 1936	Administrative	Broad Survey
Hoyman, Howard S.	Health Guide for Oregon Teachers (Grades 7-12). Columbia University. Pp. 429.	Ed.D. in Health and Physical Education, 1945	Programs	Collaboration and Integration
Hughes, Wayne P.	Safety Procedures in the School Shop. New York University. Pp. 396.	Ed.D. in Education, 1943	Methods in Teaching and Guidance	Analytical Survey and Measurement

Name	Title	Degree and Date	Topical Emphasis	Research Method
Hughes, William L.	The Administration of Health and Physical Education for Men in Colleges and Universities. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 183.	Ph.D. in Educational Research, 1932	Administrative	Broad Survey
Humiston, Dorothy	A Measurement of Motor Ability in Women. New York University. Pp. 101.	Ph.D. in Education, 1936	Methods in Testing and Research	Inventive
Hursh, John B.	Studies in the Energy Relations of Muscle. University of Rochester. Pp. 91.	Ph.D. in Physiology, 1936	Methods in Testing and Research	Experimental
Hussey, Marguerite M.	Principles and Methods of Teaching Health. New York University. Pp. 173.	Ph.D. in Education, 1931	Methods in Testing and Research	Collaboration and Integration
Hutto, Louis E.	Measurement of the Velocity Factor and of Athletic Power in High School Boys. Columbia University. Ann Arbor, Mich.: Ann Arbor Press. Pp. 29.	Ph.D. in Educational Research, 1938	Methods in Testing and Research	Factor Analysis
Ierardi, Thomas G.	The Development of a Health Guidance Blank for College Men. New York University. Pp. 93.	Ed.D. in Education, 1940	Methods in Teaching and Guidance	Inventive
Irwin, Leslie W.	A Study of the Relationship of Dominance to the Performance of Physical Education Activities. The State University of Iowa. Pp. 115.	Ph.D. in Physical Education, 1937	Scientific and Cultural Basis	Statistical Relationship and Comparative
Irvine, Dorothy L.	An Analysis of the Effectiveness of Proceedings for the Correlation of Longitudinal Arch Deviation as Indicated by Weight-Bearing Pressure Areas. New York University. Pp. 109.	Ph.D. in Education, 1942	Scientific and Cultural Basis	Experimental
Jack, Harold K.	An Analysis of the Physical Education Programs of the Minnesota Secondary Schools. New York University. Pp. 26.	Ph.D. in Education, 1944	Programs	Analytical Survey and Measurement
Jackson, Chester O.	An Evaluation of Health Practices in Interscholastic Athletics for Boys in Illinois. New York University. Pp. 170.	Ed.D. in Education, 1944	Administrative	Collaboration and Integration
Jameson, Emily D.	Physical Education for the Preparation of General Elementary School Teachers; A Study of Content and Requirements of Courses of Physical Education Offered in Twenty-Two State Teachers' Colleges and Normal Schools. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 118.	Ph.D. in Educational Research, 1930	Professional Status and Relationships	Analytical Survey and Measurement
Jenkins, Lulu M.	A Comparative Study of Achievements of Children of Five, Six, Seven Years of Age. Columbia University. Pp. 54.	Ph.D. in Health and Physical Education in T.C., 1930	Scientific and Cultural Basis	Normative
Johns, Edward B.	The Measurement of Health Practices. Stanford University. Pp. 239.	Ed.D. in Education, 1943	Methods in Testing and Research	Analytical Survey and Measurement
Johnson, Wilton D.	The Organization and Operation of the Oklahoma High School Athletic Association. The University of Oklahoma. Pp. 246.	Ed.D. in School Administration, 1943	Administrative	Analytical Survey and Measurement
Jones, Galen	Extracurricular Activities in Relation to the Curriculum. Columbia University. Pp. 99.	Ph.D. in Health and Physical Education in T.C., 1935	Programs	Analytical Survey and Measurement

Name	Title	Degree and Date	Topical Emphasis	Research Method
Jones, Hiram A.	The Administration of Health and Physical Education in New York State. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 155.	Ph.D. in Educational Research, 1934	Administrative	Collaboration and Integration
Jones, Lloyd M.	A Factorial Analysis of Ability in Fundamental Motor Skills. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 100.	Ph.D. in Educational Research, 1935	Scientific and Cultural Basis	Factor Analysis
Jones, Mrs. Theresa D.	The Development of Certain Motor Skills and Play Activities in Young Children: A Genetic Study of the Motor Development of Pre-school Children as Revealed by Their Use of Wheel Play Materials. Columbia University. Pp. 180.	Ph.D. in Health and Physical Education in T.C., 1940	Programs	Analytical Survey and Measurement
Jorgensen, Nephi M.	The Determination and Measurement of Body Build in College Men. The State University of Iowa. Pp. 62.	Ph.D. in Physical Education, 1939	Methods in Testing and Research	Normative
Kamm, Alfred	A Manual for Active Therapy for Mental Hospitals. New York University. Pp. 254.	Ed.D. in Physical Education and Health, 1944	Programs	Collaboration and Integration
Katzell, Raymond A.	Relations Between the Activity of Muscles During Preparatory Set and Subsequent Overt Performance. New York University. Pp. 94.	Ph.D. in N.Y.U. Graduate School, 1943	Scientific and Cultural Basis	Experimental
Kebric, Burt M.	Problems of Beginning Teachers of Physical Education in the High Schools of California. Stanford University. Pp. 86.	Ed.D. in Physical Education, 1945	Professional Status and Relationships	Collaboration and Integration
Keller, Louis F.	The Relation of Quickness of Bodily Movement to Success in Athletics. New York University. Pp. 100.	Ph.D. in Education, 1941	Scientific and Cultural Basis	Statistical Relationship and Comparative
Kelley, Cecelia E.	The Integrated Post-Exercise Pulse-Product as a Measure of Physical Fitness. Stanford University. Pp. 154.	Ed.D. in Education, 1939	Methods in Testing and Research	Experimental
Kelly, Alma C.	Reduction of Energy Expenditure in the Standing Position. New York University. Pp. 142.	Ph.D. in Education, 1941	Scientific and Cultural Basis	Experimental
Keyes, Ruth F.	An Appreciation of the Necessary Balance Between Physical and Mental Elements in Secondary and Collegiate Education. Boston College. Pp. 133.	Ph.D. in Education, 1932	Scientific and Cultural Basis	Philosophical or Group Thinking
Kiracofe, Edgar S.	An Historical Study of Athletics and Physical Education in the Standard Four-Year Colleges of Virginia. University of Virginia. Pp. 337.	Ph.D. in Education, 1932	Programs	Historical, Bibliographical, and Biographical
Kirk, Bertha M.	The Critical Evaluation of Present Practices in the Women's Athletic Associations in the United States. New York University. Pp. 97.	Ed.D. in Education, 1936	Programs	Broad Survey
Kirkpatrick, James B.	Physical Fitness. A Textbook of Physical Education for Schools and Clubs. Columbia University. Pp. 310.	Ed.D. in Health and Physical Education, 1943	Programs	Collaboration and Integration
Kistler, Joy W.	The Homogenous Grouping of Junior and Senior High School Boys for Physical Education Class Activities. The State University of Iowa. Pp. 62.	Ph.D. in Physical Education, 1935	Methods in Testing and Research	Statistical Relationship and Comparative

Name	Title	Degree and Date	Topical Emphasis	Research Method
Knott, Virginia B.	Physical Measurement of Young Children: A Study of Anthropometric Reliabilities for Children Three to Six Years of Age. The State University of Iowa. Pp. 145.	Ph.D. in Child Welfare, 1938	Methods in Testing and Research	Analytical Survey and Measurement
Knox, Walter S.	The Uses of the Pulse-Ratio Test for Detecting Non-Compensated Heart Lesions. The State University of Iowa. Pp. 37.	Ph.D. in Physical Education, 1938	Methods in Testing and Research	Experimental
Kovar, Daniel R.	Student Attitudes Toward the Program of Social Recreation in Certain Schools in Western Pennsylvania. The University of Pittsburgh. Pp. 153.	Ph.D. in Physical Education, 1939	Programs	Analytical Survey and Measurement
Krakower, Hyman	The Relation of Physical Stature to Ability in the Running High Jump. New York University. Pp. 166.	Ph.D. in Education, 1934	Scientific and Cultural Basis	Statistical Causal Analysis and Prediction
Kuhl, Louise	A Study of the Learning Rate of College Women in Certain Physical Activities as Related to Their General Motor Ability. The State University of Iowa. Pp. 71.	Ph.D. in Physical Education, 1941	Methods in Teaching and Guidance	Statistical Relationship and Comparative
Kulcinski, Louis	The Relation of Intelligence to the Learning of Fundamental Muscular Skills. University of Michigan. Pp. 245.	Ph.D. in Education, 1943	Scientific and Cultural Basis	Statistical Relationship and Comparative
Kunde, Norman F.	Factors Associated with Selected Leadership for Playgrounds. New York University. Pp. 191.	Ed.D. in Education, 1946	Administrative	Analytical Survey and Measurement
Laitin, Yale J.	The Extracurricular Concomitants of Personality Adjustment and Socio-Economic Status Among High School Boys. New York University. Pp. 117.	Ph.D. in Education, 1944	Scientific and Cultural Basis	Analytical Survey and Measurement
Lambert, Eugene W.	A Suggested Plan to Serve as a Guide for the Health and Physical Education Department of the University of Arkansas. Columbia University. Pp. 188.	Ed.D. in Health and Physical Education, 1942	Administrative	Collaboration and Integration
Langer, Walter C.	The Dynamics of Sensori-Motor Learning, Retention and Transfer. Harvard University. Pp. 344.	Ph.D. in Philosophy and Psychology, 1935	Scientific and Cultural Basis	Philosophical or Group Thinking
Lapp, Vernon W.	A Study of the Achilles Reflex and Its Relationship to Voluntary Motor Response in Human Subjects. The State University of Iowa. Pp. 46.	Ph.D. in Physical Education, 1934	Scientific and Cultural Basis	Experimental
Larson, Leonard A.	A Study of the Validity of Some Cardiovascular Tests. New York University. Pp. 129.	Ph.D. in Education, 1938	Methods in Testing and Research	Factor Analysis
La Salle, Dorothy M.	Physical Education for Children; a Book for Teachers in Elementary Schools. Columbia University.	Ed.D. in Health and Physical Education, 1945	Programs	Collaboration and Integration
Lauritsen, William H.	Some Techniques for Measuring Achievement of Objectives of Physical Education. The Ohio State University. Pp. 294.	Ph.D. in Physical Education, 1939	Methods in Testing and Research	Analytical Survey and Measurement
Lawrence, Gladys C.	The History of Educational Uses of Some Leisure-Time Activities. New York University. Pp. 344.	Ed.D. in Education, 1937	Aims and Objectives	Historical, Bibliographical, and Biographical

Name	Title	Degree and Date	Topical Emphasis	Research Method
Lee, Mary A. M.	The Relation of the Knee Jerk and Standing Steadiness to Nervous Instability. University of Chicago. Pp. 49.	Ph.D. in Psychology, 1931	Scientific and Cultural Basis	Experimental
Lindsay, Edith	Origins and Development of the School Health Movement in the United States. Stanford University. Pp. 503.	Ed.D. in Physical Education, 1943	Professional Status and Relationships	Collaboration and Integration
Lloyd, Frank S.	A Study of Safety in Secondary School Physical Education. New York University. Pp. 251.	Ph.D. in Education, 1932	Programs	Analytical Survey and Measurement
Lockhart, Jeanne A.	The Value of the Motion Picture as an Instructional Device in Learning a Motor Skill. University of Wisconsin. Pp. 98.	Ph.D. in Education and Physical Education, 1942	Methods in Teaching and Guidance	Analytical Survey and Measurement
Long, E. Wilbur	A Survey of Pastimes and Hobbies of Secondary School Children. The University of Pittsburgh. Pp. 76.	Ph.D. in Education, 1940	Scientific and Cultural Basis	Analytical Survey and Measurement
Long, John A.	Motor Abilities of Deaf Children. Columbia University. Pp. 67.	Ph.D. in Health and Physical Education, 1932	Scientific and Cultural Basis	Normative
Lowrie, Kathleen H.	Factors That Relate to the Extra Curricular Performance of College Women. The State University of Iowa. Pp. 128.	Ph.D. in Physical Education, 1942	Programs	Analytical Survey and Measurement
Luehring, Frederick W.	Swimming Pool Standards. Columbia University. Pp. 273.	Ph.D. in Health and Physical Education in T.C., 1939	Administrative	Normative
Lynch, Theresa I.	Communicable Disease Nursing. New York University. Pp. 346.	Ed.D. in Education, 1940	Administrative	Analytical Survey and Measurement
Lyne, Everett	Cell Division in Relation to Excessive Fatigue. New York University. Pp. 162.	Ph.D. in Education, 1945	Scientific and Cultural Basis	Experimental
Lynn, Minnie L.	Major Emphases of Physical Education in the United States. The University of Pittsburgh. Pp. 238.	Ph.D. in Education, 1944	Aims and Objectives	Historical, Bibliographical, and Biographical
MacCurdy, H. Leigh	The Measurement of Physical Capacity of Secondary School Boys. Columbia University. Pp. 59.	Ph.D. in Health and Physical Education in T.C., 1932	Methods in Testing and Research	Statistical Relationship and Comparative
MacKinnon, Emily P.	A Plan for a Program of Physical Education for Penn Hall Junior College. Columbia University. Pp. 188.	Ed.D. in Health and Physical Education, 1943	Programs	Philosophical or Group Thinking
MacNeil, John P.	The Organization and Administration of Laboratory Experience in Teaching Physical Education. New York University. Pp. 160.	Ph.D. in Education, 1932	Programs	Collaboration and Integration
Manchester, Gertrude B.	The Woman High School Teacher of Physical Education in Ohio: A Personnel Study. New York University. Pp. 368.	Ph.D. in Physical Education and Health, 1935	Professional Status and Relationships	Analytical Survey and Measurement
Manzer, Helen C.	The Physique of Women Normal School Students Compared with the Physique of Women College Students. New York University. Pp. 180.	Ph.D. in Education, 1934	Professional Status and Relationships	Statistical Relationship and Comparative

Name	Title	Degree and Date	Topical Emphasis	Research Method
Massey, Wayne W.	A Critical Study of Objective Methods for Measuring Antero-Posterior Posture with a New and Simplified Technique. The State University of Iowa. Pp. 70.	Ph.D. in Physical Education, 1938	Methods in Testing and Research	Inventive
Maxcy, John W.	A Study of Some Factors Related to the Placement of Graduates of New York State Normal Schools, with Particular Reference to the Placement of Graduates of Potsdam State Normal School. New York University. Pp. 171.	Ed.D. in Education, 1939	Professional Status and Relationships	Analytical Survey and Measurement
McAfee, Florence	A Curriculum for the Preparation of the General Elementary Teacher in Relation to Physical Education. New York University. Pp. 404.	Ed.D. in Education, 1940	Professional Status and Relationships	Collaboration and Integration
McCall, Margaret A.	The Organization and Administration of Camps Conducted by Departments of Physical Education in Colleges, Teacher-Training Institutions, and Universities in the United States. New York University. Pp. 158.	Ed.D. in Physical Education and Health, 1943	Administrative	Broad Survey
McCloy, Charles H.	Some Achievement Standards in Track and Field Events for Boys from Ten to Twenty Years of Age. Columbia University. Pp. 178.	Ph.D. in Health and Physical Education, in T.C., 1932	Administrative	Normative
McCluggage, Marston M.	Motivating Forces in the Development of Collectivized Forms of Leisure-Time Activity. University of Kansas. Pp. 278.	Ph.D. in Sociology, 1941	Scientific and Cultural Basis	Philosophical or Group Thinking
McCormick, Hubert J.	Enriching the Physical Education Service Program in Colleges and Universities. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 134.	Ed.D. in Health and Physical Education, 1942	Methods in Teaching and Guidance	Collaboration and Integration
McDaniels, Herbert E.	Appraisal of Public Health Work in Oak Park, Illinois. University of Illinois. Pp. 59.	Ph.D. in Bacteriology, 1937	Administrative	Analytical Survey and Measurement
McGilvrey, Louise	Syllabus for a Course in the Foundations of Health and Physical Education. Columbia University. Pp. 191.	Ed.D. in Health and Physical Education, 1942	Programs	Collaboration and Integration
McMurray, J. Gordon	The Relation of Skeletal Symmetry to Athletic Prowess. New York University. Pp. 79.	Ph.D. in Education, 1937	Scientific and Cultural Basis	Statistical Relationship and Comparative
McNelly, Walter C.	Some Effects of Training on the Muscular Mechanical Efficiency of the Human Body. The Ohio State University. Pp. 114.	Ph.D. in Physiology, 1934	Scientific and Cultural Basis	Experimental
Mead, Harold T.	A Survey and Evaluation of Personal Hygiene as Taught in the Accredited Colleges and Universities of New England States. Columbia University. Pp. 184.	Ph.D. in Educational Research, 1935	Programs	Broad Survey
Melcher, Ruth T.	Children's Motor Learning With and Without Vision. The Johns Hopkins University. Pp. 188.	Ph.D. in Psychology, 1934	Methods in Teaching and Guidance	Experimental

Name	Title	Degree and Date	Topical Emphasis	Research Method
Meredith, Howard V.	The Rhythm of Physical Growth: A Study of 18 Anthropometric Measurements on Iowa City White Males Ranging in Age Between Birth and 18 Years. The State University of Iowa. Pp. 128.	Ph.D. in Child Welfare, 1935	Scientific and Cultural Basis	Analytical Survey and Measurement
Meredith, William F.	Regulations Concerning the Acceptance of Health and Physical Education for College Entrance Credit; State, Regional, and Institutional Rulings. Columbia University. Norwalk, O.: Law Abstract Co. (C1933). Pp. 187.	Ph.D. in Educational Research, 1933	Administrative	Broad Survey
Merrill, Foster C.	A Study of Student Recreational Needs and the Uses Being Made of Leisure-Time Resources in a School Community. Stanford University. Pp. 362.	Ed.D. in Education, 1943	Programs	Analytical Survey and Measurement
Messer, Guerdon N.	Critical Analysis of the Application of the Rogers Physical Fitness Test to Williams College Students. New York University. Pp. 118.	Ph.D. in Education, 1932	Methods in Testing and Research	Normative
Messersmith, Lloyd L.	The Development of a Measurement Technique for Determining the Distance Traversed by Players of Basketball. Indiana University. Pp. 79.	Ed.D. in Education, 1942	Methods in Testing and Research	Inventive
Metcalf, Harlan G.	The Establishment in the Public Schools of Educational Procedures for Children with Physical Defects. New York University. Pp. 2 V.	Ph.D. in Education, 1934	Administrative	Analytical Survey and Measurement
Meyering, Harry	An Analysis of Behavior Problems Emerging from a Camp Situation. University of Michigan. Pp. 124.	Ph.D. in Education, 1937	Methods of Teaching and Guidance	Analytical Survey and Measurement
Miles, Dwight W.	Preferred Rates in Rhythmic Response. The Johns Hopkins University. Pp. 117.	Ph.D. in Psychology, 1931	Scientific and Cultural Basis	Experimental
Miller, Bernard W.	A Critical Evaluation of the Effectiveness of the Teachers in Physical Inspection of Public School Children. New York University. Pp. 682.	Ph.D. in Education, 1943	Administrative	Analytical Survey and Measurement
Miller, Dudley P.	A Mechanical Analysis of Certain Level Muscles in Man. Yale University. Pp. 195.	Ph.D. in Physiology, 1942	Methods in Testing and Research	Experimental
Mills, G. Kepler	Development of Administration Policies and Practices in Health and Physical Educational Surveys. The University of Pittsburgh. Pp. 203.	Ph.D. in Education, 1945	Administrative	Analytical Survey and Measurement
Mitchell, Elmer D.	The Growth of Physical Education and Allied Movements in the State of Michigan: A Study of Institutional Acceptance and Integration. University of Michigan. Pp. 434.	Ph.D. in Sociology, 1938	Professional Status and Relationships	Historical, Bibliographical, and Biographical
Moffett, Donovan C.	A Study of Accuracy of Direction in Motor Skills at Different Distances as Determined by the Relative Size of the Angle of Error. The State University of Iowa. Pp. 92.	Ph.D. in Physical Education, 1942	Methods in Testing and Research	Experimental
Mohr, Dorothy R.	Measured Effects of Physical Education Activities or Certain Aspects of the Physical Fitness of College Women. The State University of Iowa. Pp. 70.	Ph.D. in Physical Education, 1944	Scientific and Cultural Basis	Analytical Survey and Measurement

Name	Title	Degree and Date	Topical Emphasis	Research Method
Montgomery, Katherine W.	Principles and Procedures in the Conduct of Inter-Scholastic Athletics for Adolescent Girls. New York University. Pp. 319.	Ed.D. in Education, 1941	Administrative	Philosophical or Group Thinking
Moore, James A.	A Technique for the Appraisal of the Health Program of a Large Elementary School. University of Cincinnati. Pp. 288.	Ed.D. in Education Teachers College, 1938	Administrative	Inventive
Moore, Mary E.	Administrative Plans for Individualizing the Professional Training Program for Women at Louisiana State University. Columbia University. Pp. 153.	Ed.D. in Physical Education, 1945	Professional Status and Relationships	Philosophical or Group Thinking
Morehouse, Laurence E.	A Study of the Response of the Heart to Various Types of Exercise. The State University of Iowa. Pp. 59.	Ph.D. in Physical Education, 1941	Scientific and Cultural Basis	Experimental
Morgan, Cecil W.	A Study to Establish Standards for Certain Achievement Tests in the Victory Corps Physical Fitness Program. The University of Pittsburgh. Pp. 168.	Ph.D. in Education, 1944	Methods in Testing and Research	Normative
Morris, Charles McD.	An Experimental Analysis of Certain Performance Tests. New York University. Pp. 43.	Ph.D. in N.Y.U. Graduate School, 1938	Methods in Testing and Research	Experimental
Moss, Bernice R.	The Functions of Public Health Departments in School Health Programs in California. Stanford University. Pp. 196.	Ed.D. in Physical Education, 1946	Professional Status and Relationships	Broad Survey
Mowrer, Orval H.	The Modification of Nystagmus by Means of Repetition. The Johns Hopkins University. Pp. 232.	Ph.D. in Psychology, 1932	Scientific and Cultural Basis	Experimental
Mullen, Frances A.	Factors in the Growth of Girls. University of Chicago. Pp. 162.	Ph.D. in Education, 1939	Scientific and Cultural Basis	Collaboration and Integration
Murphy, Mary A.	A Study of the Unitary Components of Cardio-Vascular Tests. The State University of Iowa. Pp. 66.	Ph.D. in Physical Education, 1939	Scientific and Cultural Basis	Factor Analysis
Myers, Spencer W.	Criteria for the Evaluation of the Athletic Programs of Junior Colleges in North Central Association Area. Indiana University. Pp. 241.	Ed.D. in School of Education, 1942	Administrative	Analytical Survey and Measurement
Nash, Willard L.	A Study of the Stated Aims and Purposes of the Departments of Military Science and Tactics, and Physical Education in the Land-Grant Colleges of the United States. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 129.	Ph.D. in Educational Research, 1934	Aims and Objectives	Philosophical or Group Thinking
Neilson, Neils P.	A Study of Achievement in Selected Athletic Events. University of California. Pp. 164.	Ph.D. in Education, 1937	Methods in Testing and Research	Analytical Survey and Measurement
Nelson, E. H.	The Present Status of the Health and Physical Education Program in the One-Room Rural Schools in Pennsylvania, with Special Reference to the Children Who Present Behavior Problems. New York University. Pp. 91.	Ph.D. in Physical Education, 1931	Programs	Analytical Survey and Measurement
Nevins, Irma Gene	Home Accidents and Their Prevention. New York University. Pp. 231.	Ed.D. in Education, 1941	Programs	Philosophical or Group Thinking

Name	Title	Degree and Date	Topical Emphasis	Research Method
Nordly, Carl L.	The Administration of Intramural Athletics for Men in Colleges and Universities. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 134.	Ph.D. in Educational Research, 1937	Administrative	Analytical Survey and Measurement
Norton, N. Lucille	A Proposed Course of Study for Physical Education in Elementary Schools of Texas. New York University. Pp. 326.	Ed.D. in Education, 1946	Programs	Analytical Survey and Measurement
Oberteuffer, Delbert	Personal Hygiene for College Students; A Study of the Curiosities, Interests, and Felt Needs of College Students in the Subject Matter of Personal Hygiene. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 121.	Ph.D. in Educational Research, 1930	Programs	Analytical Survey and Measurement
O'Donnell, Mary P.	Creative Dance for Children. New York University. Pp. 117.	Ed.D. in Education, 1945	Programs	Analytical Survey and Measurement
O'Keefe, Pattric R.	A Comparative Study of the Anthropometric Measurements of Positive and Negative Tuberculin Reactions. The State University of Iowa. Pp. 59.	Ph.D. in Physical Education, 1942	Methods in Testing and Research	Statistical Relationship and Comparative
Olds, Lloyd W.	Study of the Effects of Competitive Basketball Upon the Physical Fitness of High School Boys as Determined by McCurdy-Larson Organic Efficiency Tests. University of Michigan. Pp. 143.	Dr. P.H. in Hygiene and Public Health, 1939	Scientific and Cultural Basis	Experimental
Olesen, Frederik A.	An Experimental Analysis of the Relative Effect of Exercise Upon the Gross Musculature in College Students. New York University. Pp. 139.	Ph.D. in Education, 1934	Scientific and Cultural Basis	Experimental
Osborne, Ernest G.	The Individualization of Large Group Camping. Columbia University. Pp. 192.	Ph.D. in Health and Physical Education in T.C., 1936	Methods in Teaching and Guidance	Analytical Survey and Measurement
Osborne, Ernest G.	Camping and Guidance. Columbia University. Pp. 260. (Same as above; this appears to be an enlarged version of the actual thesis done in 1936.)	Ph.D. in Health and Physical Education, 1937	Aims and Objectives	Philosophical or Group Thinking
Osborne, William T.	The Relative Accuracy of Officiating Basketball from Different Positions. New York University. Pp. 164.	Ph.D. in Education, 1941	Administrative	Analytical Survey and Measurement
Osnato, Eva J.	Enriching the Program of Physical Education of a New York City High School for Girls in the Light of the Objective, Worthy Use of Leisure Time. New York University. Pp. 325.	Ed.D. in Education, 1941	Programs	Philosophical or Group Thinking
Owens, William A., Jr.	Inter-Individual Differences Versus Intra-Individual Differences in Motor Skills. University of Minnesota. Pp. 71.	Ph.D. in Psychology, 1941	Methods in Testing and Research	Statistical Relationship and Comparative
Palmer, W. Carlton	The Sports Needs of University of Alabama Students After Graduation. New York University. Pp. 124.	Ph.D. in Education, 1935	Scientific and Cultural Basis	Analytical Survey and Measurement
Paterson, Ann	An Evaluation of the Teacher Education Program for Undergraduate Women Students, Columbia University. Pp. 182.	Ed.D. in Health and Physical Education, 1944	Professional Status and Relationships	Philosophical or Group Thinking

Name	Title	Degree and Date	Topical Emphasis	Research Metho
Paulsen, Gaige B.	The Measurement of Motor Control with Special Reference to Individual Variability, Reliability and Implication. University of Minnesota. *Journal of Applied Psychology*, 19: 29-42, 166-179. Pp. 179.	Ph.D. in Psychology, 1935	Methods in Testing and Research	Experimental
Peace, James S.	A Manual of the Organization and Conduct of an Intramural Recreational Program for Colleges and Universities. New York University. Pp. 237.	Ed.D. in Education, 1943	Programs	Collaboration and Integration
Petroskey, Helen	A History of Measurement in Health and Physical Education in the United States. The State University of Iowa. Pp. 600.	Ph.D. in Physical Education, 1946	Methods in Testing and Research	Historical and Biographical
Phillips, Bernath E.	The Relationship Between Certain Phases of Kinesthesis and Performance During Early Stages of Acquiring Two Perceptuo-Motor Skills. The Pennsylvania State College. Pp. 99.	Ph.D. in Physical Education, 1942	Scientific and Cultural Basis	Statistical Relationship and Comparative
Piper, Ralph A.	Night Football in the United States, with Special Consideration of Standards of Lighting. New York University. Pp. 140.	Ed.D. in Education, 1941	Administrative	Analytical Survey and Measurement
Plewes, Doris W.	A Course of Study in Health, Physical Education and Recreation. Columbia University. Pp. 430.	Ed.D. in Health and Physical Education, 1943	Programs	Philosophical or Group Thinking
Powdermaker, Theresa	Physical Education Play Activities for Girls in Junior and Senior High Schools. New York University. Pp. 627.	Ed.D. in Education, 1937	Programs	Collaboration and Integration
Pratoomratha, Zeng Vizir	A Physical Education Curriculum for the Teachers College of Thailand. New York University. Pp. 170.	Ed.D. in Education, 1944	Programs	Philosophical or Group Thinking
Preston, Everett C.	Principles and Statutory Provisions Relating to Recreational, Medical, and Social Welfare Agencies in the Public Schools. Columbia University. Pp. 141.	Ph.D. in Health and Physical Education, 1935	Administrative	Collaboration and Integration
Price, Hartley D.	The Establishment of the Principles Which Are Essential for the Realization of the Objectives of Physical Education. New York University. Pp. 333.	Ph.D. in Education, 1946	Aims and Objectives	Philosophical or Group Thinking
Pritchard, Earl A.	The Organization and Management of Physical Education, Recreation, and Health Education Sources and Materials in a Local Central Office. New York University. Pp. 89.	Ph.D. in Education, 1932	Administrative	Analytical Survey and Measurement
Quigley, Thomas J.	A Normative Survey of Administration and Practices in the Health Programs of the Schools of Pennsylvania. The University of Pittsburgh. Pp. 147.	Ph.D. in Education, 1945	Administrative	Analytical Survey and Measurement
Quimby, Rexford C.	Body Weight in Relation to Certain Skeletal Measurements. New York University. Pp. 79.	Ph.D. in Education, 1932	Methods in Testing and Research	Statistical Causal and Analysis Prediction
Rapparlie, John H.	Motor Ability of the Larger Musculature with Particular Reference to Athletic Performance. The Ohio State University. Pp. 223.	Ph.D. in Psychology, 1941	Scientific and Cultural Basis	Experimental
Rarick, Lawrence	An Analysis of the Speed Factor in Simple Athletic Activities. The State University of Iowa. Pp. 47.	Ph.D. in Physical Education, 1937	Scientific and Cultural Basis	Factor Analysis

Name	Title	Degree and Date	Topical Emphasis	Research Method
Rathbone, Josephine L.	Residual Neuro-Muscular Hypertensions: Implications for Education. Columbia University. Pp. 220.	Ph.D. in Health and Physical Education, in T.C., 1936	Scientific and Cultural Basis	Collaboration and Integration
Rearick, Elizabeth C.	Dances of the Hungarians. Columbia University. Pp. 151.	Ph.D. in Health and Physical Education, in T.C., 1939	Scientific and Cultural Basis	Historical, Bibliographical, and Biographical
Rhoton, Paul	Health Misconceptions of Prospective Teachers. The Pennsylvania State College. Pp. 118.	Ed.D. in Education and Psychology, 1932	Professional Status and Relationships	Analytical Survey and Measurement
Richardson, Hazel A.	Dance in the Curriculum of the Elementary School. Columbia University. Pp. 301.	Ed.D. in Health and Physical Education, 1944	Programs	Analytical Survey and Measurement
Richey, Herman G.	The Blood Pressure in Boys and Girls Before and After Puberty and Its Relation to Growth and Maturity. University of Chicago. Pp. 174.	Ph.D. in Education, 1930	Scientific and Cultural Basis	Statistical Relationship and Comparative
Robb, Elda	The Energy Requirement of Normal Three- and Four-Year Old Children Under Standard Basal Metabolism Conditions and During Periods of Quiet Play. Columbia University. Pp. 57.	Ph.D. in Health and Physical Education in T.C., 1935	Scientific and Cultural Basis	Experimental
Roberts, Mary P.	A Study of Children's Play in the Home Environment. The State University of Iowa. Pp. 158.	Ph.D. in Child Welfare, 1932	Scientific and Cultural Basis	Analytical Survey and Measurement
Robinson, Reginald	The Leisure-Time Activities of Public School Children from Ten to Eighteen Years of Age Attending Junior High School and Living on the Lower West Side of New York City. New York University. Pp. 212.	Ph.D. in Education, 1936	Programs	Analytical Survey and Measurement
Rodgers, Elizabeth G.	An Experimental Investigation of the Teaching of Team Games; A Study Applied to the Elementary School Level of Three Methods of Teaching. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 65.	Ph.D. in Educational Research, 1936	Methods in Teaching and Guidance	Experimental
Rogers, Laurence T.	A Study of Relationship Between Certain Aspects of Physique and Sprinting Ability. New York University. Pp. 105.	Ph.D. in Education, 1933	Scientific and Cultural Basis	Statistical Relationship and Comparative
Romney, Golden	A Study of Factors Which Contribute to the Curricular Interests of Students of 9th Grade with Special Reference to Physical Education. New York University. Pp. 135.	Ph.D. in Education, 1936	Programs	Analytical Survey and Measurement
Roth, Charles	Hand-Eye Dominate as a Factor in Motor Ability. New York University. Pp. 73.	Ph.D. in Education, 1942	Scientific and Cultural Basis	Experimental
Rowe, Charlotte	A Study of the Effects of Vitamin A and Vitamin D on Cultures of Epithelial and Connective Tissues. New York University. Pp. 72.	Ph.D. in Education, 1939	Scientific and Cultural Basis	Experimental

Name	Title	Degree and Date	Topical Emphasis	Research Method
Ruef, Dorothy, N.	Health Education in Senior High Schools; A Study of the Qualifications, Status, Affiliations, and Functions of Persons Responsible for Health Education in Senior High Schools, with Special Reference to New Jersey. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 106.	Ph.D. in Educational Research, 1934	Programs	Analytical Survey and Measurement
Rugen, Mabel E.	The Organization of Physical and Health Education Teacher-Training Institutions Preparing Teachers for the Elementary Grades. New York University. Pp. 139.	Ph.D. in Physical Education and Health, 1930	Professional Status and Relationships	Collaboration and Integration
Russell, Helen L.	Teacher Education in Physical Education with Special Reference to the Major Programs for Women in Selected State Teachers' Colleges. University of Illinois. Pp. 309.	Ph.D. in Education, 1944	Professional Status and Relationships	Broad Survey
Salit, Elizabeth P.	The Development of Fundamental Sport Skills in Freshman College Women of Low Motor Ability. The State University of Iowa. Pp. 196.	Ph.D. in Physical Education, 1944	Scientific and Cultural Basis	Experimental
Salt, Ellis B.	Health Misconceptions of 7th-, 10th-, and 12th-Grade Students. New York University. Pp. 148.	Ed.D. in Education, 1936	Scientific and Cultural Basis	Analytical Survey and Measurement
Sanders, Agnes P.	A Study of Dietary Habits and Nutritional Status of One Hundred Pennsylvania Families. The Pennsylvania State College. Pp. 275.	Ph.D. in Home Economics, 1937	Scientific and Cultural Basis	Analytical Survey and Measurement
Sanders, Jewell E.	Safety and Health in Organized Camps. Columbia University. Pp. 133.	Ph.D. in Health and Physical Education in T.C., 1931	Programs	Analytical Survey and Measurement
Saurborn, Jeannette B.	Patterns of Children's Choices, Duration of Interests, and Successful Adaptation to Playground Activities. New York University. Pp. 149.	Ph.D. in Physical Education and Health, 1943	Programs	Analytical ment Survey and Measure-
Scannell, John A.	A Study in the Exercise Factor in the Growth of College Freshmen. Indiana University. Pp. 109.	Ed.D. in Education, 1940	Scientific and Cultural Basis	Statistical Relationship and Comparative
Schmidt, George H.	The Relation of Certain Anthropometric Characteristics to the Weight of High School Boys. New York University. Pp. 56.	Ph.D. in Education, 1932	Methods in Testing and Research	Statistical Causal Analysis and Prediction
Schneider, Grenafore W.	A Playground Director's Manual. Columbia University. Pp. 285,	Ed.D. in Health and Physical Education, 1946	Programs	Collaboration and Integration
Schneider, Nathaniel O.	Teacher Preparation for Safety Education. New York University. Pp. 382.	Ed.D. in Education, 1940	Professional Status and Relationships	Analytical Survey and Measurement
Schorsch, Robert S.	Psychology of Play. University of Notre Dame. Pp. 116.	Ph.D. in Philosophy, 1942	Scientific and Cultural Basis	Collaboration and Integration
Schroeder, Elinor M.	Trend and Reliability of Successive Units of Archery Score, and Study of Selected Factors Which Appear to Influence Such Scores. Columbia University. Pp. 210.	Ph.D. in Health and Physical Education in T.C., 1945	Programs	Analytical Survey and Measurement

Name	Title	Degree and Date	Topical Emphasis	Research Method
Schwendener, Norma	Game Preferences of 10,000 Fourth-Grade Children. Columbia University. Pp. 49.	Ph.D. in Health and Physical Education, in T.C., 1932	Programs	Analytical Survey and Measurement
Scott, M. Gladys	The Assessment of Motor Abilities of College Women Through Objective Tests. The State University of Iowa. Pp. 96.	Ph.D. in Physical Education, 1937	Methods in Testing and Research	Analytical Survey and Measurement
Seen, Eva M.	Critical Evaluation of Present Best Practice in Supervision of Physical Education. New York University. Pp. 176.	Ed.D. in Education, 1937	Administrative	Philosophical or Group Thinking
Seger, Garrette K.	A Study of Adequate Building and a Recreation Field Suitable to the Needs of the Revised Program in Health and Physical Education at the State Normal School, Geneseo, N. Y. New York University. Pp. 74.	Ed.D. in Education, 1938	Administrative	Collaboration and Integration
Seigerseth, Peter O.	An Attempt to Isolate and Identify Fundamental Factors that Underlie Motor Fitness as Measured by Large-Muscle Performance. University of Oregon. Pp. 71.	Ed.D. in Education, 1944	Scientific and Cultural Basis	Factor Analysis
Settle, Caskey	A Study of Health, Physical Education, and Physical Recreational Activities of the Public Schools and Community of the Borough of Rutherford, New Jersey. Columbia University. Pp. 159.	Ed.D. in Health and Physical Education in T.C., 1936	Programs	Analytical Survey and Measurement
Sharman, Jackson R.	Physical Education Facilities for the Public Accredited High Schools of Alabama. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 78.	Ph.D. in Educational Research, 1930	Administrative	Analytical Survey and Measurement
Sharp, Della L.	Group and Individual Profiles in the Association-Motor Test. The State University of Iowa. Pp. 128.	Ph.D. in Child Welfare, 1938	Methods in Testing and Research	Analytical Survey and Measurement
Sharp, LeRoy H.	Effects of Residual Tension on Output and Energy Expenditure in Muscular Work. Northwestern University. Pp. 50.	Ph.D. in Psychology, 1940	Scientific and Cultural Basis	Experimental
Shaw, John H.	A Study of the Requirements for the Master's Degree for Men Students Majoring in Physical Education at Teachers College, Columbia University. Pp. 218.	Ed.D. in Health and Physical Education in T.C., 1939	Professional Status and Relationships	Analytical Survey and Measurement
Shaw, William A.	The Relation of Muscular Action Potentials to Imaginal Weight Lifting. Columbia University. Pp. 51.	Ed.D. in Health and Physical Education in T.C., 1939	Scientific and Cultural Basis	Statistical Relationship and Comparative
Siebrecht, Elmer B.	The Construction and Validation of a Scale for the Measurement of Attitudes Toward Safety in Automobile Driving. New York University. Pp. 142.	Ed.D. in Education, 1941	Methods in Testing and Research	Inventive
Silverman, Lewis K.	A Study of Factors That are Associated with Activity Choices of Participants in Organized Public Recreation Centers. New York University. Pp. 146.	Ph.D. in Education, 1942	Programs	Analytical Survey and Measurement
Sinclair, Caroline B.	The Development of Physical Education in Tennessee. New York University. Pp. 306.	Ph.D. in Education, 1936	Programs	Historical, Bibliographical, and Biographical

Name	Title	Degree and Date	Topical Emphasis	Research Method
Skalet, Magda V.	The Significance of Delayed Reactions in Young Children. The Johns Hopkins University. Pp. 162.	Ph.D. in Psychology, 1930	Scientific and Cultural Basis	Experimental
Smith, Edwin L.	A Study of the Maximum Capacity of the Vascular System. University of Chicago. Pp. 17.	Ph.D. in Physiology, 1942	Scientific and Cultural Basis	Experimental
Smith, Gwen	Kinesiological Analysis of Selected Phases of the Physical Education Program for College Women. The State University of Iowa. Pp. 199.	Ph.D. in Physical Education, 1946	Methods in Teaching and Guidance	Experimental
Smith, Helen G.	The Extent to Which Women Students at a State College, Classified According to Major Field Specialization, are Characterized by Certain Measurable Traits. New York University. Pp. 321.	Ph.D. in Education, 1944	Professional Status and Relationships	Analytical Survey and Measurement
Smith, Paul W.	The Relation Between Initial Tension and Fiber Length and the Mechanism of Energy Release in Striated Muscles. University of Illinois. Pp. 76.	Ph.D. in Physiology, 1934	Scientific and Cultural Basis	Experimental
Spencer, Mary E.	Health Education for Teachers; A Critical Study of Pre-Service Preparation of Classroom Teachers for the School Health Program. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 118.	Ph.D. in Educational Research, 1933	Professional Status and Relationships	Analytical Survey and Measurement
Sperling, Abraham P.	The Relationship Between Personality Adjustment and Achievement in Physical Education Activities. New York University. Pp. 115.	Ph.D. in Education, 1941	Scientific and Cultural Basis	Statistical Relationship and Comparative
Spitz, George B., Jr.	A Critical Examination of the Relationship of Certain Factors to Achievement in the Physical Test Employed in the Formation of the Eligible List for the Fire Department of the City of New York in 1941. New York University. Pp. 84.	Ed.D. in Physical Education and Health, 1943	Scientific and Cultural Basis	Statistical Relationship and Comparative
Stafford, George T.	Adapted Sports for Atypical Secondary School Boys. New York University. Pp. 304.	Ed.D. in Education 1937	Programs	Philosophical or Group Thinking
Steers, William H.	A Program of Health, Safety, Physical Education, and Recreation for the Public Schools. A Study of Health, Safety, Physical Education, and Recreation Activities of the Public Schools and Community of Metuchen, New Jersey. Columbia University. Pp. 254.	Ed.D. in Health and Physical Education, 1940	Programs	Analytical Survey and Measurement
Stevens, Andrew C.	An Analysis of Health Broadcasts Received in California During 1942 - 1943. Stanford University. Pp. 439.	Ed.D. in Physical Education, 1944	Scientific and Cultural Basis	Collaboration and Integration
Stone, William	The Relationship Between Instruction in Knowledge of Health Practices and the Performance of Health Practices in the Home. New York University. Pp. 177.	Ph.D. in Education, 1944	Methods in Teaching and Guidance	Statistical Relationship and Comparative
Storey, Edward J.	Free Printed Materials in Health Education. New York University. Pp. 157.	Ed.D. in Education, 1941	Programs	Historical, Biographical and Bibliographical

Name	Title	Degree and Date	Topical Emphasis	Research Method
Strohoefer, Francis K.	The Development of Procedures for Meeting Leisure-Time Needs for Boys. New York University. Pp. 122.	Ed.D. in Education, 1940	Methods in Teaching and Guidance	Philosophical or Group Thinking
Struthers, Alice B.	Functional Periodicity and Efficiency. The University of Southern California. Pp. 415.	Ph.D. in Psychology, 1936	Scientific and Cultural Basis	Experimental
Sudduth, Solon B.	Study and Appraisal of Health Education in Alabama. George Peabody College for Teachers. Pp. 189.	Ph.D. in Education, 1942	Programs	Analytical Survey and Measurement
Sweigard, Lulu E.	Bilateral Asymmetry in the Alignment of the Skeletal Framework of the Human Body. New York University. Pp. 184.	Ph.D. in Education, 1939	Methods in Testing and Research	Analytical Survey and Measurement
Talbot, Jean	An Interpretation of Physical Education for the Teacher in the Elementary Grades. New York University. Pp. 164.	Ed.D. in Education, 1943	Administrative	Philosophical or Group Thinking
Tandy, W. Lou	Economics of Leisure. University of Illinois. Pp. 179.	Ph.D. in Economics, 1934	Administrative	Analytical Survey and Measurement
Taylor, Harold T.	Administrative Implications of Health and Safety Records of Public School Children. Indiana University. Pp. 129.	Ed.D. in Education, 1941	Administrative	Analytical Survey and Measurement
Taylor, John W.	Youth Welfare in Germany; A Study of Governmental Action Relative to Care of the Normal German Youth. Columbia University. Nashville, Tenn.: Baird-Ward Co. Pp. 259.	Ph.D. in Health and Physical Education, 1936	Administrative	Collaboration and Integration
Thisted, Moses N.	A Study of the Relationship Between Participation in College Athletics and Vocational Success. The State University of Iowa. Pp. 220.	Ph.D. in Education, 1932	Professional Status and Relationships	Broad Survey
Thomas, Muriel L.	A Plan for the Preparation in Health Education in College X of Prospective Elementary and Secondary Teachers. Columbia University. Pp. 218.	Ed.D. in Health and Physical Education, 1945	Professional Status and Relationships	Philosophical or Group Thinking
Thompson, Claude E.	A Study of Motor and Mechanical Abilities. The Ohio State University. Pp. 87.	Ph.D. in Psychology, 1940	Scientific and Cultural Basis	Experimental
Thompson, Ethel M.	A Study of the Energy Expenditures and Mechanical Efficiency of Young Girls and Adult Women. Columbia University. Pp. 45.	Ph.D. in Health and Physical Education, 1941	Scientific and Cultural Basis	Experimental
Thompson, William D.	The Development of Physical Education in the District of Columbia Public Schools. New York University. Pp. 731.	Ed.D. in Education, 1941	Programs	Historical, Bibliographical, and Biographical
Tilton, John P.	An Objective Study of Body Build in Relation to the Use of Height-Weight Norms. Harvard University. Pp. 287.	Ed.D. in Education, 1933	Scientific and Cultural Basis	Statistical Relationship and Comparative
Troester, Carl A.	A Plan for Improving the Certification of Physical Education Teachers in the Secondary Schools of Connecticut. Columbia University. Pp. 218.	Ed.D. in Health and Physical Education, 1943	Administrative	Philosophical or Group Thinking
Twitmyer, Edward M.	Visual Guidance in Motor Learning. University of Pennsylvania. Pp. 187.	Ph.D. in Psychology, 1932	Methods in Teaching and Guidance	Experimental

Name	Title	Degree and Date	Topical Emphasis	Research Method
Van Dalen, Deobold	A Study of the Play of Deviates in Strength-Motor Tests. University of Michigan. Pp. 222.	Ph.D. in Education, 1944	Scientific and Cultural Basis	Statistical Relationship and Comparative
Van Zee, Viola	Role of Recreation in Chicago From 1803 to 1848 as Revealed in Literature Available in the Metropolitan Area. Northwestern University. Pp. 315.	Ph.D. in Sociology, 1942	Programs	Historical, Bibliographical, and Biographical
Vernier, Elmon L.	Physical Training for Airmen; A Manual for the High School Physical Education Teacher. Columbia University. Pp. 70.	Ed.D. in Health and Physical Education, 1942	Programs	Collaboration and Integration
Voltmer, Carl D.	A Brief History of Intercollegiate Conferences of Faculty Representatives; with Special Consideration of Athletic Problems. Columbia University. Pp. 100.	Ph.D. in Health and Physical Education, 1936	Administrative	Historical, Bibliographical, and Biographical
Voth, Albert G.	A Study of Personality Types Through the Autokinetic Phenomenon. University of Kansas. Pp. 104.	Ph.D. in Psychology, 1938	Scientific and Cultural Basis	Experimental
Wagner, Carlos J.	Organization and Procedure in the Conduct of Track and Field Meets. New York University. Pp. 118.	Ed.D. in Physical Education, and Health, 1937	Administrative	Collaboration and Integration
Wagner, Tobias	The Work Efficiency of Physically Disabled Industrial Workers. New York University. Pp. 187.	Ph.D. in Education, 1945	Scientific and Cultural Basis	Experimental
Waite, Alexander	Effects of Varied Instruction on the Learning of a Certain Motor Skill. Duke University. Pp. 131.	Ph.D. in Psychology, 1941	Methods in Teaching and Guidance	Experimental
Wakefield, Markham C.	A Study of Mortality Among Men Who Have Played in the High School State Final Basketball Tournaments. Indiana University. Pp. 159.	Ed.D. in Education, 1944	Scientific and Cultural Basis	Statistical Causal and Analysis Prediction
Walke, Nelson S.	Traits Characteristic of Men Majoring in Physical Education at the Pennsylvania State College. New York: Bureau of Publications, Teachers College, Columbia University. Pp. 62.	Ph.D. in Educational Research, 1937	Professional Status and Relationships	Analytical Survey and Measurement
Walker, Herbert	A Study of the Respiratory Activity of Normal Healthy Men and Boys. Harvard University. Pp. 128.	Ed.D. in Education, 1934	Scientific and Cultural Basis	Experimental
Wann, Mrs. Marie D.	A Study of Fact and Attitude About Gonorrhea as Demonstrated by Questionnaire Study. Columbia University. Pp. 68.	Ph.D. in Educational Research, 1943	Scientific and Cultural Basis	Broad Survey
Warner, Edna A.	The Contribution of the Case Method to Guidance in a Summer Camp. University of Cincinnati. Pp. 162.	Ed.D. in Education, 1940	Methods in Teaching and Guidance	Analytical Survey and Measurement
Washington, Edward L.	An Evaluation of the New York City Junior High School Physical Fitness Test. New York University. Pp. 85.	Ed.D. in Education, 1935	Administrative	Philosophical or Group Thinking
Washke, Paul R.	The Development of the American Association for Health, Physical Education, and Recreation and Its Relationship to Physical Education in the United States. New York University. Pp. 375.	Ph.D. in Education, 1943	Professional Status and Relationships	Historical, Bibliographical, and Biographical

Name	Title	Degree and Date	Topical Emphasis	Research Method
Waterman, Emma F.	The Ability of the Physical Educator to Make Judgments on the Items of a Physical Examination for Women Students in Colleges and Universities. New York University. Pp. 282.	Ph.D. in Education, 1935	Methods in Testing and Research	Analytical Survey and Measurement
Watson, Katherine G.	A Study of the Relation of Certain Measurements of College Women to Throwing Ability. New York University. Pp. 94.	Ph.D. in Education, 1935	Scientific and Cultural Basis	Statistical Causal Analysis and Prediction
Weber, Elmer W.	A Study of the Relationship of Certain Health Factors to Scholarship. Indiana University. Pp. 87.	Ed.D. in Education, 1941	Scientific and Cultural Basis	Analytical Survey and Measurement
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Wendler, Arthur J.	A Critical Analysis of Test Elements Used in Physical Education. The State University of Iowa. Pp. 65.	Ph.D. in Physical Education, 1936	Methods in Testing and Research	Factor Analysis
West, Wilbur	A Study of Speed Versus Accuracy in the Acquisition of Skill. University of Michigan. Pp. 77.	Ph.D. in Psychology, 1936	Scientific and Cultural Basis	Experimental
White, Clifton W.	A Study to Determine Which Anthropometric Measurements Best Predict Optimum Body Weight. University of Oregon. Pp. 73.	Ed.D. in Education, 1946	Scientific and Cultural Basis	Statistical Causal Analysis and Prediction
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Willis, Edna	A Study to Determine Whether Certain Factors Influence the Leisure-Time Activities and Interests of School of Education Students at New York University. New York University. Pp. 405.	Ph.D. in Physical Education and Health, 1940	Scientific and Cultural Basis	Statistical Relationship and Comparative
Wilson, Marjorie W.	Development of Jumping Skill in Children. The State University of Iowa. Pp. 97.	Ph.D. in Physical Education, 1945	Professional Status and Relationships	Experimental
Winograd, Samuel	The Relationship of Timing and Vision to Basketball Performance. New York University. Pp. 72.	Ph.D. in Education, 1942	Scientific and Cultural Basis	Statistical Causal Analysis and Prediction
Witty, Paul A.	A Study of the Deviates in Versatility and Sociability of Play Interest. Columbia University. Pp. 57.	Ph.D. in Health and Physical Education, 1930	Methods in Testing and Research	Analytical Survey and Measurement
Wohlford, Mildred B.	Certain Personality Traits of High School Girls Classified According to Individual Patterns of Participation on Physical Education Activities. New York University. Pp. 276.	Ph.D. in Education, 1944	Scientific and Cultural Basis	Analytical Survey and Measurement
Woodard, Patricia	An Experimental Study of Transfer of Training in Motor Learning. University of Pennsylvania. Pp. 32.	Ph.D. in Psychology, 1942	Scientific and Cultural Basis	Experimental
Wulfeck, Wallace H.	Motor Function in the Mentally Diseased. Yale University. Pp. 183.	Ph.D. in Psychology, 1938	Scientific and Cultural Basis	Analytical Survey and Measurement
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Young, Carl H.	The Construction of a Manual for Use in the Physical Appraisal and Development of Cadets in the Naval Aviation Training Program. Stanford University. Pp. 81.	Ed.D. in Education, 1946	Programs	Collaboration and Integration
Zimmerli, Elizabeth K.	A History of Physical Education for Women at Stanford University and a Survey of the Department of Physical Education for Women in 1943-1944. Stanford University. Pp. 332.	Ed.D. in Physical Education, 1945	Professional Status and Relationships	Collaboration and Integration
Zasloff, Ira	Manual of Square Dancing. New York University. Pp. 195.	Ed.D. in Education, 1944	Programs	Collaboration and Integration
Zook, Earl	A Study of the Physical Growth of Boys by Means of Water Displacement. University of Chicago. Pp. 112.	Ph.D. in Education, 1930	Methods in Testing and Research	Analytical Survey and Measurement

Study of a Series of Physical Education Tests by Factor Analysis

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In the past, numerous physical education tests have been developed which presumably measure many different aspects of the individual's motor makeup. We have tests of agility, power, strength, motor ability, motor educability, balance, cardiovascular response, physical fitness, and many other traits. In some cases the constructors of these tests have offered more or less acceptable measures of validity, provided we are willing to accept the criterion measure; in other cases the validity is based purely on subjective judgment.

It is the purpose of this investigation to examine a group of physical education tests recommended for use with girls. Through the factor analysis technique it should be possible to isolate the traits or factors which are common to a series of physical education tests and thus determine more exactly what the true nature of each of these tests is.

PROCEDURE

Two hundred and fifty-six college women participated as subjects, but only the 200 who completed all of the tests were used in the final analysis. All women were enrolled in the regular physical education classes and were in good health, as evidenced by the University physical and medical examinations. Since college women were the subjects, tests were selected which have been used, or recommended for use, with college women and which have been designated as measuring several aspects of the individual's physical makeup.

Table I lists the tests selected and the traits which they presumably measure. Since a complete description of all tests used would consume too much space, source references only are included in Table I.

The tests were administered during a seven-week period by three regular instructors in the department of physical education for women at Indiana University.* These instructors were assisted by 20 women majors in physical education who had been specially

* Acknowledgement is made to Mrs. Eloise Ridder and Miss Dean Summers for their invaluable assistance in organizing and administering the tests.

TABLE I

TESTS AND TRAITS WHICH THEY MEASURE

Trait Measured	*Test*	*Reference (numbers refer to bibliography)*
Agility	Side Step	# 5, McCloy, p. 85
	Burpee	# 5, McCloy, p. 84
	Agility Run	See Appendix for description
Motor Ability	Humiston	#12, U.S. Office Ed. Bull., p. 92
	Scott (Battery No. 2)	# 9, Scott, p. 402
	Standing Broad Jump	
	Obstacle Race	
	Basketball Throw	
Balance	Bass	# 5, McCloy, p. 150
Motor Educability	Iowa Brace	# 5, McCloy, p. 74
Power	Jump and Reach	# 5, McCloy, p. 65
	Standing Broad Jump	
Back Strength	Dynamometer	# 5, McCloy, p. 31
Leg Strength	Dynamometer	# 5, McCloy, p. 31
Grip Strength	Dynamometer	# 5, McCloy, p. 30
Foot Strength	20-yard Hop	#12, U.S. Office Ed. Bull., p. 91
Abdominal Strength	Situps, No. Possible	#12, U.S. Office Ed. Bull., p. 89
	Situps, 30 sec.	#12, U.S. Office Ed. Bull., p. 89
	Situps, 1 min.	Same as 30 sec. test only for 1 min.
	V Sit	#12, U.S. Office Ed. Bull., p. 90
	½ Sit Hold	See Appendix for description
Arm- and Shoulder-Girdle Strength	Chinning	# 5, McCloy, p. 33
	Pushups	# 5, McCloy, p. 32
General Strength	Strength Index	# 5, McCloy, p. 365
Cardiovascular Fitness	Brouha	# 3, Clarke, Harriet, p. 358
Lung Capacity	Spirometer	# 2, Clarke, H. Harrison, p. 139

trained in the details of the tests. There were never more than twenty-five subjects measured during each testing period of 35 minutes, and at least two of the regular instructors and two major student assistants were present during each period. Due to the close supervision of the testing, it was possible to eliminate a considerable amount of the error which accompanies group testing.

In order to prevent muscle lameness from some of the more strenuous tests, short training periods were given during the one or two weeks preceding such tests as situps, chinning, and pushups, and the stool stepping used in the Brouha test.

In an attempt to make it a worthwhile educational experience and for purposes of motivation and stimulating interest, each girl was given a master sheet which provided space for her to write her name, age, height and weight, and on which were listed the tests to be administered. Before each test was given, the purpose of the test was explained and the need each individual had for possessing that quality

TABLE II

TABLE OF INTERCORRELATIONS

	Obstacle Race 1	*20-Yd. Hop* 2	*Agility Run* 3	*Humiston Motor Ability* 4	*V Sit* 5	*Bass Balance* 6	*½ Sit Hold* 7	*Side Step* 8	*Brace* 9	*Burpee* 10	*Situps 30 Seconds* 11	*Situps 1 Minute* 12
2. 20-yd. Hop	.4871											
3. Agility Run	.6134	.5185										
4. Humiston Motor Ability	.5603	.4113	.5128									
5. V Sit	.0991	.0959	.1719	.2370								
6. Bass Balance	.4495	.3578	.3554	.3912	.2008							
7. ½ Sit Hold	.1307	.1219	.1336	.2960	.4470	.1232						
8. Side Step	.5400	.3146	.4114	.4839	.0855	.2864	.1444					
9. Brace	.4177	.3231	.3549	.4416	.1791	.4201	.0851	.2930				
10. Burpee	.3016	.3484	.3749	.2730	.1625	.1812	.2048	.2428	.1962			
11. Situps 30 Seconds	.3210	.2038	.3167	.1637	.4304	.1813	.3445	.3007	.2581	.29		
12. Situps 1 Minute	.1989	.1797	.1866	.2434	.4128	.2317	.2502	.1248	.2323	.18	.7829	
13. Jump and Reach	.3707	.4559	.3960	.4344	.0509	.2670	.1541	.2945	.4123	.27	.2591	.1941
14. Basketball Throw	.3877	.3700	.3822	.4089	.1458	.3328	.1442	.3910	.3048	.35	.2463	.1393
15. Broad Jump	.4826	.4569	.4885	.4475	.0941	.2898	.0503	.3950	.3764	.36	.2346	.1791
16. Scott Motor Ability	.5749	.5035	.5250	.5952	.1498	.3978	.1421	.5195	.4351	.42	.3135	.2013
17. Situps, No. Possible	.2033	.2239	.2674	.2890	.4471	.1472	.2600	.1299	.1502	.23	.5602	.5829
18. Brouha	.1422	.1931	.2062	.1635	.0739	.0945	.0561	.1515	.1102	.10	.0842	.1039
19. Right Grip	.0615	.1244	.0679	.1533	.0351	.1112	.0552	.1222	.0201	.03	.1223	.0164
20. Left Grip	.0923	.0732	.0227	.1211	.0421	.1038	.0141	.1555	.0828	.05	.0370	.0080
21. Back Strength	.2298	.2064	.1965	.2978	.0905	.2000	.1660	.2179	.1212	.15	.1674	.1423
22. Leg Strength	.2312	.2107	.1542	.3031	.1195	.2012	.2233	.2385	.0915	.13	.2301	.1764
23. Chinning	.3043	.3201	.2762	.3599	.2659	.2779	.2374	.2170	.2032	.18	.2903	.2847
24. Dips	.3831	.3769	.3505	.3773	.1537	.2895	.0182	.0540	.3040	.24	.2408	.2899
25. Strength Index	.2195	.1967	.1545	.3042	.1056	.2131	.1973	.2313	.0902	.12	.2027	.2223
26. Spirometer	.1944	.1340	.1717	.2150	.1379	.1983	.1379	.2108	.1579	.07	.2032	.1114

was related to everyday living; i.e., the need for strength in different parts of the body, need for agility, balance, etc. National norms, when available, or local norms were read in terms of scores rated as superior, good, high average, low average, poor, and failure, thus allowing each girl to know her rating on each test.

Test results were charted on each girl's master sheet so that at the end of the testing period each girl had what was called her "motor fitness profile." At the end of each testing period a few minutes' discussion was held in which procedures for overcoming weaknesses were recommended. (Girls were encouraged to seek a conference with their physical education instructors when tests showed up weaknesses in certain areas.)

Every effort was made to interest all the girls in the program and to encourage them to give their best performance on every test.

TABLE II (Cont.)

	Situps 30 Seconds	*Situps 1 Minute*	*Jump & Reach*	*Basketball Throw*	*Broad Jump*	*Scott Motor Ability*	*Situps No. Possible*	*Brouha*	*Right Grip*	*Left Grip*	*Back Strength*	*Leg Strength*	*Chinning*	*Dips*	*Strength Index*
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
11															
12	.7829														
13	.2591	.1941													
14	.2463	.1393	.2768												
15	.2346	.1791	.4411	.5369											
16	.3135	.2013	.4256	.8853	.7178										
17	.5602	.5829	.1549	.2142	.1813	.2432									
18	.0842	.1039	.0413	.2151	.0891	.1937	.1059								
19	.1223	.0164	.1968	.2884	.2585	.2916	.0849	.1303							
20	.0370	.0080	.1965	.2034	.1885	.2703	.0750	.1166	.6662						
21	.1674	.1423	.2407	.3520	.2734	.4073	.2244	.1753	.5149	.4855					
22	.2301	.1764	.2212	.3633	.2319	.3572	.2327	.1957	.4220	.3518	.7457				
23	.2903	.2847	.1859	.1960	.1724	.2530	.3569	.2550	.0668	.0792	.2116	.2095			
24	.2408	.2899	.2374	.1594	.3004	.2784	.2944	.1345	.0693	.1595	.1296	.0876	.4531		
25	.2027	.2223	.2566	.4028	.2748	.4365	.2145	.1838	.6262	.5734	.8934	.8922	.2265	.0898	
	.2032	.1114	.2728	.3200	.2792	.3285	.1461	.0771	.2991	.2245	.3619	.3863	.0101	.0664	.4444

The instructors concerned with the experiment felt that interest was high and that the large majority of girls did respond with their best efforts as evidenced by their enthusiasm, their willingness to take the tests, and that mean scores on almost all tests were higher than the norms.

The 325 intercorrelations basic to the factor analysis were calculated on the Holerith machine and then arranged in a correlation matrix. Table II gives the intercorrelations between tests. The Thurstone method of factor analysis (10, 11, 12) was used to isolate the factors common to the tests. The unrotated factor loadings are given in Table III and the rotated loadings in Table IV.

DISCUSSION AND INTERPRETATIONS

It is recognized by the writer that there are many statisticians and students of research who do not accept the theory of factor analy-

sis and who regard the factors extracted to be merely artifacts. The following interpretations do accept factor analysis theory and are made on that basis. The factors extracted are identified because of their correlations with the various tests. The presence of a specific factor or factors is recognized when "uniqueness" is fairly large. When the communality (sum of the factor loadings squared) of a test is less than unity it is said to possess uniqueness. Uniqueness includes all the variance in a test which is due to a specific factor or factors and to errors of sampling.

Factor one is identified as general strength because of its high correlation with the Strength Index and all the individual dynamometer tests. It also shows significant correlations with tests in which strength has generally been considered to be a factor (standing broad jump, basketball throw, Scott motor ability). The Strength Index has the highest correlation (.8702) with this factor.

Factor two is identified as abdominal strength because of its correlations with the three situp tests, V sit, and half-sit hold. These tests involve primarily the use of the abdominal and hip-joint flexors, so the designation of factor two as abdominal strength is probably

TABLE III

FACTOR LOADINGS BEFORE ROTATION

	K_1	K_2	K_3	K_4	h^2
Obstacle Race	.6399	.2800	.2633	.1386	.5764
20-yd. Hop	.5742	.2172	.2332	.1185	.4452
Agility Run	.6111	.3032	.2392	.1278	.5388
Humiston Motor Ability	.6815	.1936	.1791	.1804	.5664
V Sit	.3565	.2137	—.4278	—.1662	.3834
Bass Balance	.5018	.1504	.1284	.1769	.3221
½ Sit Hold	.3388	.0952	—.3614	—.1032	.2652
Side Step	.5274	.1033	.2040	.0621	.3344
Brace	.4833	.2677	.1979	.0353	.3456
Burpee	.4334	.1854	—.0575	—.0934	.2342
Situps, 30 Seconds	.5624	.2725	—.4738	—.3212	.7182
Situps, 1 Minute	.4813	.2813	—.5375	—.1797	.6319
Jump and Reach	.5281	.1087	.1948	—.0166	.3289
Basketball Throw	.6683	—.1150	.2885	—.2556	.6083
Broad Jump	.6289	.0994	.3540	—.1895	.5666
Scott Motor Ability	.7984	.0075	.3743	—.2139	.8234
Situps, No. Possible	.4797	.2138	—.4685	—.0907	.5034
Brouha	.2755	—.0761	.0191	.1543	.1058
Right Grip	.4090	—.5807	.0900	—.2070	.5555
Left Grip	.3590	—.5406	.1716	—.0927	.4591
Back Strength	.5991	—.5952	—.1510	.2251	.7867
Leg Strength	.5886	—.5572	—.2354	.2578	.7788
Chins	.4717	.1774	—.1741	.2895	.3681
Dips	.4194	.3192	.0619	.1638	.3084
Strength Index	.6313	—.7029	—.2049	.1236	.9498
Spirometer	.4072	—.2752	.0226	—.1721	.2716

TABLE IV

ROTATED FACTOR LOADINGS

	K_1 *General Strength*	K_2 *Abdominal Strength*	K_3 *Speed*	K_4 *Unidentified*	h^2
Obstacle Race	.0707	.0625	.6348	.4051	.5760
20-yd. Hop	.0927	.0500	.5529	.3582	.4451
Agility Run	.0346	.0816	.6197	.3828	.5387
Humiston Motor Ability	.1521	.1182	.5628	.4609	.5662
V Sit	.0544	.5924	.1706	.0069	.3830
Bass Balance	.0944	.0845	.4029	.3790	.3219
½ Sit Hold	.1255	.4828	.1135	.0557	.2648
Side Step	.1755	.0353	.4690	.2870	.3344
Iowa Brace	.0253	.0769	.5287	.2436	.3453
Burpee	.0990	.1792	.4252	.1061	.2340
Situps, 30 Seconds	.1535	.7524	.3557	—.0421	.7180
Situps, 1 Minute	.0679	.7552	.2332	.0495	.6318
Jump and Reach	.1914	.0591	.4917	.2166	.3288
Basketball Throw	.5075	.0069	.5888	.0633	.6083
Standing Broad Jump	.2956	—.0138	.6840	.1051	.5664
Scott Motor Ability	.4650	.0083	.7628	.1577	.8231
Situps, No. Possible	.0995	.6594	.2025	.1288	.5034
Brouha	.1664	.0347	.0981	.2595	.1058
Right Grip	.7388	—.0600	.0760	—.0068	.5552
Left Grip	.6510	—.1577	.0701	.0741	.4591
Back Strength	.7398	.1369	—.0648	.4649	.7863
Leg Strength	.6951	.2113	—.1047	.4897	.7786
Chins	.0281	.3231	.2115	.4670	.3680
Dips	—.0826	.1632	.4054	.3311	.3081
Strength Index	.8702	.1822	—.0941	.3879	.9498
Spirometer	.4803	.0802	.1840	.0238	.2716

as suitable as any other. Situps for one minute have the highest correlation (.7552) with this factor.

Factor three is easily recognized as velocity or speed due to its relatively high correlations with all the events in which speed is known to be a factor, and its zero correlations with the dynamometer strength events. The Scott motor ability test has the highest correlation (.7628) with this factor.

Factor four is not given any identity in this study, since it presents two conflicting sets of correlations. Two of its highest correlations are with tests of dynamometer strength (back and leg); it also yields relatively high correlations with chins and dips, but zero correlations with grip strength. On the other hand, it also yields many of its highest correlations with tests in which the main factor is speed.

At first thought this factor might be identified as some form of coordination, agility, or motor ability, but its very low or zero correlations with such tests as the Burpee test, basketball throw, broad jump, and Scott motor ability tend to discount this solution.

Three tests were included in this analysis which presumably measure agility: the agility run, side step, and Burpee. Agility has been defined as "the ability to change the direction of the body or parts of the body in space very rapidly" (5, p. 84). All three of the agility tests have a significant correlation with speed which should certainly be a factor in an agility test, since by definition the body must be moved "very rapidly." None of the tests has a significant (one percent level) correlation with strength. Since we are concerned with agility in large-muscle coordinations, it might be felt that strength should be a more potent factor in an agility test than was found in any of the so-called agility tests in this study.

The important thing to note about these three tests is that there is no third factor which is common to them all, or any two of them. This means that if we are to continue to call these tests measures of agility, we must do one of two things: accept speed as the only factor concerned in agility, or, through further experimentation, discover the specific factor or factors present in each of these tests and decide which specific factor or factors will constitute the best measure of agility in a combination with speed.

Two tests of motor ability were included, the Humiston and Scott tests. Speed and strength are the prominent factors involved. The Scott Test has a high correlation with speed (.7628) and a significant correlation with strength (.4650). The Humiston Test has a fairly high correlation with speed (.5628), but its correlation with strength (.1521) is not significant at the one percent level. Studies (5, p. 127) have shown that there are two types of tests which are valid measures of general motor ability: "(1) a combination of three or four track and field events scored in points, together with (2) a strength test." Since numerous studies (1, 4, 7, 14) made on subjects of both sexes have shown that the two basic factors involved in track and field events and strength tests are speed and strength, we may then accept the fact that speed and strength are the important factors in general motor ability. In this case the Scott Test becomes a very good measure of general motor ability for college women. Even if we were to have a perfect measure of motor ability, one without sampling errors, and that provided an equal measure of the two factors, speed and strength, the highest correlation of the test with each of the factors would be .7072, $[(.7072)^2+(.7072)^2=1.00]$ since h^2 on a perfect test is one. Since we have found that the Scott Test correlates above .7072 with the speed and fairly high with the strength factors, this is further evidence of its validity as a measure of general motor ability; while the Humiston Test with its lower correlation with speed and lack of significant correlation with strength is not as good.

The 20-yard hop was included in this study as a measure of foot

strength. Its correlations on the speed (.5529) and strength (.0927) factors indicate that it is related to the speed factor but not the strength factor. However, this does not eliminate the possibility that this test is a measure of foot strength. Since the communality (h^2) of the 20-yard hop is only .4451 it is theoretically possible for the test to have a correlation of .745 with a specific factor. ($\sqrt{1-h^2}=.745$). If this specific factor could be proven to be foot strength we could then use the test with some confidence in its validity. At the present time, however, we have no such proof and the test cannot be legitimately called a measure of foot strength. The one thing of which we can be fairly certain is that if foot strength is the specific factor in the 20-yard hop, then foot strength is not being measured by any of the other tests to any significant degree.

The Bass balance test was the only test of its kind used in this study. It was thought that if balance, as measured by the Bass Test, were a definite factor basic in significant amounts to any of the other physical education tests, a balance factor would appear in the analysis. The Bass Test correlated .4029 with speed and .3790 with the unidentified factor, both significant correlations. The communality of the test is only .3219, so it seems that there is a specific factor in the test not found in any of the other tests to any appreciable degree. Therefore, this study has not offered any proof as to whether or not the Bass Test is really a measure of balance as claimed, but simply shown that if it is a measure of balance, then the form of balance it measures is not basic to any of the other tests studied.

Motor educability is defined as "the type of 'intelligence' which characterizes the individual who learns motor skills easily and well, as contrasted with the person who learns them poorly and with great difficulty" (5, p. 68). The Iowa Brace test was used as a measure of this quality. The communality of the Iowa Brace test is only .3453 so again we can reason that there is probably a specific factor in the test which is not present in any of the other tests, and this factor may be motor educability. Successful execution of the test is dependent somewhat on the possession of speed as is shown by the correlation of .5287 between the test and the speed factor. This is supported by Wendler's study (13) with junior high school boys in which he found a correlation of .676 between the Iowa Brace test and his velocity factor. In both this study and Wendler's strength was found to be an insignificant factor.

Two tests which have been designated as measures of power have been studied, the jump and reach and standing broad jump. An accepted definition of power is that "power equals force times velocity" (5, p. 56), interpreting force to mean strength and velocity to mean speed. Neither of the tests has a very high correlation on either of the two factors. The highest correlation (.6840) is between

the broad jump and the speed factor, the lowest (.1914) between jump and reach and the strength factor. Considering just these two tests the broad jump is the better measure of power in terms of its correlations on the factors of speed and strength. But, if we accept the definition of speed times strength as a measure of power, it would seem that the Scott Motor Ability test is a better measure of power than either the broad jump or jump and reach. Is the Scott test measuring power or motor ability? If power and motor ability are the same thing we should clarify our thinking in those terms. The side step, which has been called an agility test, correlates almost exactly the same with the speed and strength factors as does the jump and reach, our test of power, so again a confusion in terms results.

General strength was measured by a series of dynamometer tests and chinning and dipping. It can be seen that all the dynamometer tests are doing a fairly good job on measuring general strength while the Strength Index, involving a combination of all the strength tests, measures the general strength factor best of all (.8702).

It is interesting to note that chinning and dipping do not correlate significantly with the general strength factor while both show a significant correlation with the speed factor. It would seem that we should no longer regard these two tests as contributing to the measurement of general strength in college women, and eliminate them from the Strength Index test. The communality for both chins (.3680) and dips (.3081) is so low that it is quite probable that a specific factor or factors are present in each. It would have been reasonable to expect that both of these tests would exhibit a correlation with an arm-strength factor, but since such a factor did not appear in the analysis the only possible conclusion is that neither of these tests has a specific factor of arm strength or that only one of them has. Further research would be needed to establish the facts.

Abdominal strength was measured by a series of situp tests, the half-sit hold, and V sit. Situps for one minute have the highest correlation (.7552) with the abdominal strength factor. All the situp tests are more related, in terms of their correlations, to the abdominal strength factor than either the V sit or the half-sit hold. We might conclude from this that the dynamic type of abdominal strength test is a more effective measure than the static type. All of the situp tests exhibit low, but significant, correlations with the speed factor, and, as might be expected, the V sit and half-sit hold are not significantly correlated with this factor. We might conclude from this that the situp tests are measuring abdominal power and the others, abdominal strength.

None of the so-called abdominal strength tests has a significant correlation at the one percent level with the general strength factor, which would indicate that these tests measure some form of abdomi-

nal strength only, and would give no indication as to the general strength of the individual.

The Brouha test, a measure of cardiovascular condition, and the spirometer, a measure of lung capacity, were included in this analysis mainly to round out the testing program for the students. It was not anticipated that these tests would measure any factors in common with the other tests of the analysis, and this expectation was substantiated. The only correlation of any significance was that between the spirometer and the general strength factor (.4803).

SUMMARY AND CONCLUSIONS

Several physical education tests were administered to 200 college women. Intercorrelations between the tests were analyzed by the Thurstone factor analysis method (10, 11, 12).

The purpose of this study was to further an understanding of the nature of several tests commonly used to measure various aspects of the motor and physical condition of college women.

1. In a series of physical education tests which presumably measured such diverse traits as agility, motor ability, balance, motor educability, power, back, leg, grip, foot, abdominal, arm and general strength and organic fitness, four factors emerged. Three factors are identified as speed, general strength and abdominal strength; the fourth is unidentified.

2. Since almost all of the tests have fairly low communalities there is present in each test a fairly large uniqueness. Uniqueness includes all the variance in the test due to a specific factor or factors and to errors in sampling. If there is a specific factor or factors present in each of the tests, then further investigation is needed to identify these factors.

3. There is no factor common to the three agility tests other than speed. If there is a specific factor of agility, further investigation is needed in order to identify it.

4. The two motor ability tests have as common factors only speed and strength. However, it has been pointed out that many investigators accept these two factors as the important elements in motor ability. In this case, the Scott motor ability test may be accepted as a good measure of motor ability since it correlates .7628 with speed and .4650 with strength.

5. The 20-yard hop, called a measure of foot strength, has a fairly high correlation with speed but insignificant with general strength. If the specific factor in the 20-yard hop is foot strength, then foot strength is not a factor basic, in any appreciable degree, to any of the other tests.

The same type of conclusion can be reached concerning the Bass

Test (balance) and the Iowa Brace Test (motor educability). If these tests are really measuring what they claim, neither balance nor motor educability is a significant factor in the performance of any of the other tests. That effective performance on the Brace Test is dependent somewhat on speed is shown by its correlation of .5287 with the speed factor.

6. The two tests of power (speed times strength) have significant correlations with the speed and strength factors. The broad jump appears to be a better measure of power than jump and reach, since both its correlations are higher. However, if we accept the power definition (speed times strength) the Scott Motor Ability test is the best power measure of all. This points up the need for clarifying our conception of these various traits.

7. General strength is measured satisfactorily (.8702) by the Strength Index, although chins and dips can be eliminated from the battery without lowering the correlation. Chins and dips do not have significant correlations with the general strength factor, but do have significant correlations with the speed factor. One of these tests may have a specific factor of arm strength, but apparently both of them are not measures of arm strength.

8. Abdominal strength as identified in this study, is best measured by the dynamic type test represented by situps as compared to the static type represented by V sits and half-sit hold. Since the situp tests also have significant correlations with the speed factor, they might be thought of as tests of abdominal power.

9. The Brouha test, a test of functional physicial fitness, is measuring entirely different factors than the other tests used in this study.

10. This study is only exploratory in nature. Further investigation is needed in order to determine more exactly what traits our physical education tests are measuring.

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Appendix

1. *Agility run.*—Three chairs are set up, one behind the other, with a distance of 10 feet between each chair. The starting and finishing line is drawn even with the back legs of the first chair. Another line is drawn even with the front legs of the third chair. The subject assumes a prone position, facing chairs and to the left of them, head and body behind starting line. At the signal "go," subject jumps to his feet, runs to the line drawn even with the third chair, turns and comes back to starting line, circles to the right of first chair, to left of second, to right of third chair; coming back he circles to right of second chair, to left of first chair, runs on right of chairs to line drawn even with third chair, and back across finish line. The score is the time consumed from the word "go" until subject crosses finish line.

2. *Half-Sit hold.*—Subject sits on the floor, hands on hips, trunk erect (90° angle with floor). On the signal "go," the trunk is lowered back until it forms a 45° angle with floor. This position is held as long as possible.

A Study of Emotion Revealed in Two Types of Athletic Sports Contests*

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INTRODUCTION

While a great many research projects have been conducted for the purpose of exploring physiological changes and modifications induced by physical exercise of various kinds and under various conditions, relatively few have been directed towards those emotions which, most coaches agree, commonly precede competitive athletic sports contests. The almost complete absence of such studies is entirely understandable, however, when one considers that "emotion" is an intangible and badly understood factor of the human personality which has as yet to be even adequately defined.

After a thorough study of available literature on the subject, the present investigation was undertaken in the belief that while it is not possible to measure "emotion" as such, certain varieties of emotion do have measurable physiological aspects. The problem, of course, was to devise a physiological test which, while not too cumbersome, could be expected to provide a certain insight into the physical mechanisms of the emotions of athletes in the process of anticipating approaching competitive action.

Following is a report upon the investigation which was conducted in an effort to probe into the emotional phase of athletic sports contests.

PURPOSE OF THE STUDY

A. To explore the relationship of emotion and competitive physical activities.

B. To compare pre-contest emotional reactions of participants in a violent team sport (football) with those of participants in a combative sport (wrestling). These two sports were selected for comparison because of their contrasting natures; i.e., football is a team sport in which individuals work together, assist each other, rest oc-

* The author wishes to express sincere appreciation to Professors Granville B. Johnson and Fred D'Amour of the University of Denver for their guidance in the research and preparation of this study and to the many members of the football and wrestling teams at the University of Denver for their patient cooperation as human guinea pigs.

casionally, receive instructions from a designated person for every play, share in achievement and in failure, etc.; on the other hand, wrestling is a combative sport in which the contestant stands entirely alone, must rely on his own wits, his own planning of offense and defense, and his own endurance and strength for success. In winning or losing the wrestler stands nakedly alone on his accomplishment or failure.

C. To compare objective type physiological testing with subjective contestant introspective testing of pre-competition emotion.

D. To check post-contest body adjustment as measured by subjective and objective phases of the testing.

E. In terms of these observations, to attempt to conceive practical application from the point of view of training and coaching football and wrestling.

THE SUBJECTS

A. Fifteen experienced football players and later five experienced wrestlers were selected for repeated objective testing. Additional individuals were used to increase the sampling whenever time allowed.

B. Subjective test. The fifteen football players and five wrestlers were questioned regularly; many additional competitors including some on opposing teams were also interviewed (i.e., approximately 40 football players, 120 testings, and 30 wrestlers, 160 testings).

PROCEDURE

The test administered consisted of two principal phases:

A. Subjective or contestant introspective phase, in which contestants were observed as to their emotional reactions and were questioned verbally as to their sports backgrounds, attitudes towards competition, the intensity of their anticipation of a coming contest, and how whatever emotions they had made them feel physically. In an attempt at standardization, the contestants were asked to locate their "feeling" in terms of a simple scale, showing their approximate degree of tension or anxiety. The scale was graded upwards in five steps beginning with "no tension or anxiety" and ending with "extreme tension or anxiety." This subjective test was given on appropriate occasions, often up to within seconds of actual competition.[1]

B. The objective or physiological test phase. A comparatively simple test was devised which might be expected to afford insight into emotional reaction. It consisted in securing heart rate, blood pressure, and blood sugar. As experiments of Griffith, and later Bulatao and Cannon, have demonstrated, the secretion of the adrenal

[1] The importance of this introspective report type of testing is stressed by R. C. Darling in his article "Physical Fitness," *Journal of the American Medical Association*, 136:764 (March 13, 1948).

glands is ". . . an important factor in all cases of excess amounts of sugar in the blood and the urine."[2] Thus, an observation of blood sugar in times of emotional stimulation may probably be considered indicative of sympathetic nervous system activity and of bodily adjustment for emergency situations.[3] (In arriving at the blood sugar content of the blood the comparatively simple micro method of Folin and Malmros was deemed sufficiently accurate for purposes of this study.) It was believed that a combination of these three factors might reasonably be expected to demonstrate to a certain degree precontest emergency modifications, physiologically speaking, and these modifications might then be studied as possible limited indices to total psychosomatic reaction.[4]

A series of five tests was given to the group selected in connection with each contest.

1. Test I, four to six days in advance of the contest. It was supposed that at this time little or no emotion had as yet been aroused in anticipation; thus, this particular test was used to establish a sort of normal or starting point for the individual and the group.

2. Test II, the day before the contest.

3. Test III, a few hours before the contest.

4. Test IV, immediately before the contest.

5. Test V, approximately fifteen minutes after the contest.

During weeks when no contests were held, the test was administered to the groups in order to ascertain more closely the approximate normals of heart rate, blood pressure, and glucose for each individual. In order to avoid the effects of digestion upon heart rate and blood pressure and to avoid glucose in the process of assimilation, the tests were run at least two hours after meals. The subjects were tested in a sitting position. A rest period of more than two minutes before testing was usually impossible. Only the final test was preceded by vigorous exercise.

RESULTS OF THE STUDY

A. Objective phase (Chart I).

1. Anticipation of football games (Table I). As measured, football players appeared to experience comparatively little emotional build-up preceding games. Appreciable rise is seen only in Test IV (pre-game).

2. Anticipation of wrestling matches (Table II). As measured, wrestlers demonstrated marked emotional build-up in anticipation

2 Frederick H. Lund. *Emotions.* New York: The Ronald Press Co., 1942, pp. 58.

3 Walter B. Cannon. *Bodily Changes in Pain, Hunger, Fear, and Rage.* New York: D. Appleton and Co., 1923, Chaps. XI, XII, and Lund, *op. cit.*, Chap. III.

4 Lund, *op. cit.*, Chaps. II-V; and Cannon, *op. cit.*, Chaps. III, V, XI, XII.

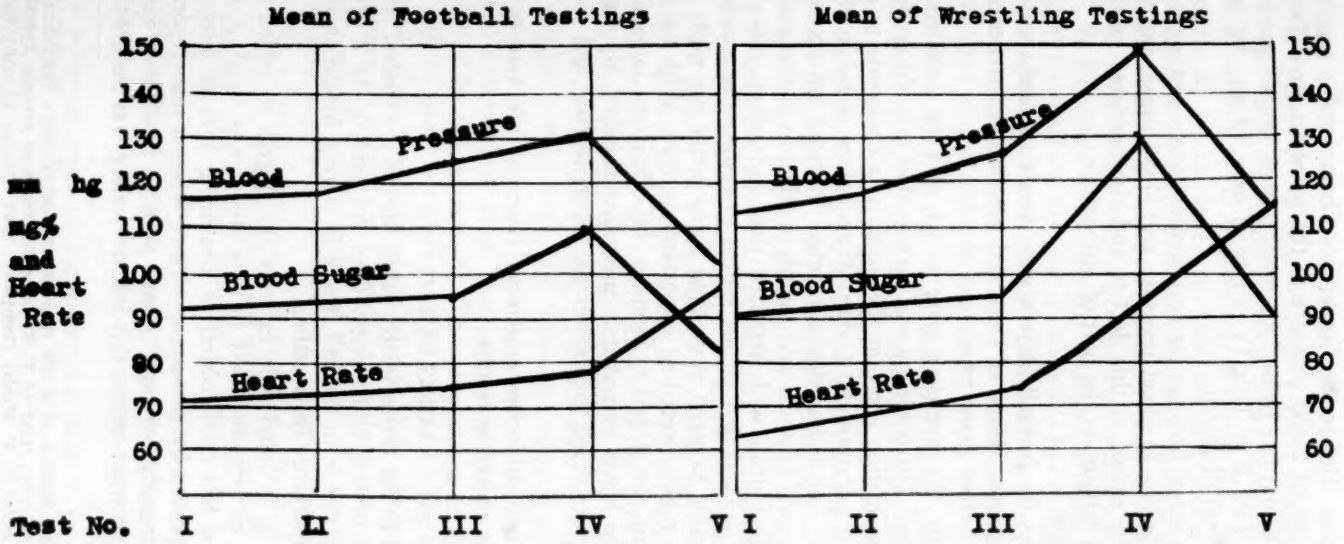

Chart I. This shows a comparison between football players and wrestlers in terms of blood sugar, blood pressure, and heart rate during the course of the respective competitive seasons. Chart I consists of an average of three football games involving 15 men, 144 administrations of the test; and 8 wrestling matches, involving 7 men and 170 administrations of the test. The hyperglycemia of the football players (Test IV or pre-game) is consistent with the findings of Edwards, *et al.*, in 1931, as described by E. F. Gildea in "The Relationship Between Various Emotional Disturbances and the Sugar Content of the Blood," *American Journal of Psychiatry*, 92:115 (July, 1935).

of wrestling matches. Before the Conference Championship matches, e.g., the average rise of blood pressure of the wrestlers from Test I to Test IV was 50 mm hg. Before the most crucial football game of the season, from Test I to Test IV a rise of only 13 mm hg. was recorded for the football group.

3. The post-contest findings for both football and wrestling were characterized by decline in blood pressure and blood sugar, and rise in heart rate.[5] The extent of this decline and rise appeared to vary with the extent of fatigue on the part of individuals.

B. Subjective phase.

1. As a group, the football players were aware of comparatively little pre-game emotion. Most of them did not become particularly excited until just before game time.

2. As a group, the wrestlers were aware of very considerable pre-contest emotion. The tendency was for emotion to build up from slight nervous anticipation early in the week in a crescendo to extreme tension and nervousness a short time before actual contact with the opponent. Some contestants reported "nervous anticipation" of the wrestling season as much as a month in advance of the season. All of the wrestlers dealt with reported that their sleep was disturbed because of anticipation on the nights preceding the matches; two men were unable to sleep more than three hours per night for from one to three nights preceding important matches. With the exception of one man, the wrestlers found it difficult if not impossible to study during the hours immediately preceding matches. By match time they usually described themselves as being nervous and tense to an extreme.

In both groups, subjective emotional reactions are seen to be consistent with the objective results.

CONCLUSIONS

A. In regard to the teams tested, while strong pre-contest emotion of the nature of fear and anxiety does not seem to be a particularly prominent factor in football, there is strong indication that it is of serious importance in wrestling.

B. Although it is impossible to state the degree to which the physiological test of emotion used in this study was valid, it did serve as a more or less crude objective measuring stick of intensity of the emotion reported by contestants. Thus, when a man reported himself to be "extremely nervous," it was possible to observe something of how and to what extent this intense feeling was manifesting itself physically.

[5] For discussion and studies of heart rate and blood pressure variations in relation to physical activity, refer to T. K. Cureton, *Physical Fitness Appraisal and Guidance*, St. Louis: C. V. Mosby Company, 1947, Chaps. VI and VII.

OBSERVATIONS

A. *Diet.*—While most football players perhaps may eat a light meal two to three hours before a game without apparent harmful effect (seven football players reported that they felt better for competition after a minimum of food intake), probably because of the emotional factor the wrestlers observed consistently felt and performed better on an absolute minimum of food intake on the day of a match. Even though such a pre-contest meal is consumed with pleasure, its digestion will be greatly retarded if taken in the presence of such pre-contest excitement as this study has demonstrated. The studies of Cannon, Bickel, Sasaki, Hellebrandt, *et al.*, on the subject of gastro-intestinal changes induced by emotion may be cited in substantiation of this recommendation.[6]

B. *Emotional drain.*—Excessive pre-match tension on the part of individual wrestlers appears to have a decided deleterious effect in terms of their performance and feeling of well-being during and after competition. Those wrestlers who demonstrated excessive excitement previous to matches rarely performed well. However, two extremely tense individuals who for one reason or another did not experience their customary emotional disturbance before a given match were observed to perform in an altogether improved manner; i.e., they seemed to think more effectively, possibly because worry was not serving to impair control of the higher brain centers.[7] Their movements on these occasions showed better direction, their endurance seemed greater, and their reported fatigue, less. These factors, while not measured, emphasize the influence of emotional drains. It is probable that an important factor in coaching wrestling should be to remain alert to fear and anxiety problems that arise in individuals. These problems are often carefully concealed and most reluctantly confessed by the contestants. The proportions of these problems on the part of some wrestlers may be gauged by the fact that two war veteran subjects questioned stated that their pre-contest anxiety was sometimes as great if not greater than their pre-invasion or pre-air combat anxiety had been during the war. As the psychologist Lund has pointed out, ". . . it is only to a limited extent that such emotion is under voluntary control."[8] It would be educationally significant if wrestling were to be a calculated means of teaching young men ways of handling such intense emotion in themselves.

C. It was noted that in most cases a condition of painful tension was characterized by high blood pressure accompanied by relatively low heart rate. When both blood pressure and heart rate were quite

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[6] W. B. Cannon. *Digestion and Health*. New York: W. W. Norton & Co., Inc., 1936, Chap. IV, and Lund, *op. cit.*, pp. 125, *ff.*

[7] Lund, *op. cit.*, pp. 237, *ff.*

[8] *Op. Cit.*, pp. 238.

high, the subjects tended to be excited and eager but not painfully emotional.

D. In view of emotional excitement occasioned by wrestling, teaching of wrestling skills or strategy the day before or the day of a match is probably of questionable efficacy.

In conclusion, a great deal more work along lines of this study must be done before conclusive results can be obtained. In the present study it was not possible to handle a sufficient number of subjects to justify statistical analysis; there was a lack of adequate controls in terms of diet, individual living regimes, extraneous emotion factors, and actual control conditions for administration of the test. However, it is felt that the research has been fruitful to the extent that it makes some contributions to better understanding of football and wrestling as emotion situations, and may possibly suggest directions for further study.

TABLE I

ANTICIPATION OF FOOTBALL GAMES

Test	*Average of 3 games*	*Low-high variation*	*No. cases tested*
	A. Heart Rate		
Testings			
1 (4-6 days before)	70 per min.	51-100	36
2 (day before)	72	54-96	36
3 (2-5 hrs. before)	74	54-90	34
4 (pre-game)	78	66-90	12
5 (post-game)	90	66-122	21
	B. Blood pressure		
1	117 mm hg	95-150	36
2	118	100-135	35
3	124	98-148	43
4	130	110-136	12
5	103	90-118	20
	C. Blood sugar		
1	93 mg%	72-105	36
2	93	70-98	36
3	96	83-111	36
4	110	88-158	12
5	84	68-95	20

Self-Analysis of Contestants and Subjective Phase

Test	*Variation of emotion reported*	*Average*	*No. cases*
1	None to slight	No emotion	40
2	None to slight	No emotion	36
3	None to some	No emotion	45
4	Slight to considerable	Some emotion	60

TABLE II

ANTICIPATION OF WRESTLING MATCHES

Test	*Average of 8 matches*	*Low-high variation*	*No. cases tested*
	A. Heart rate		
1 (4-6 days before)	66 per min.	46-96	26
2 (day before)	69	56-86	31
3 (2-5 hrs. before)	70	52-96	34
4 (pre-match)	99	60-128	35
5 (post-match)	114	100-138	21
	B. Blood pressure		
1	116 mm hg	102-138	30
2	117	102-136	32
3	122	102-164	34
4	148	118-220	44
5	114	88-140	21
	C. Blood sugar		
1	90 mg%	80-125	72
2	91	77-118	33
3	96	69-118	32
4	130	90-170	31
5	90	77-117	20

Self-Analysis of Contestants and Subjective Phase

Test	*Variation of emotion reported*	*Average*	*No. cases*
1	None to slight	No emotion	40
2	None to considerable	Some emotion	36
3	Some to extreme	Considerable	45
4	Considerable to extreme	Extreme	60

A Study in Acquaintanceship and Social Status in Physical Education Classes*

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With the present emphasis of education upon individual and social adjustment, there is increasing interest in the social aspects of physical education. As Lloyd has said:

> The physical educator is in part a sociologist, being interested in the direction of social behavior, the influence of social situations upon individuals, and the influence of the individual on social groups. (1)

It has been assumed that physical education activity is a socially valuable feature of life and education and that socialization is an important part of the educative process. As educators we talk a great deal about social development, learning to work with others, and the socializing influences, but in actual practice too often much of social development and social adjustment is left to chance.

The problem of the socially unadjusted is a real one and must be met if we are to serve the pupil effectively. The devastating effects of personal insecurity in the midst of group life have been understood for some time and studies have shown that lack of participation in the activities of the group and not having friends within the group contribute to the isolation and insecurity of the individual. Physical educators have been concerned for some time with sociological outcomes, but inasmuch as there have been no means by which to measure social behavior, social interaction, and the other aspects of our program, it has been difficult to estimate how much is being accomplished in this area.

In this study, the author will use some of the research techniques of the social sciences to show that the teacher can do much to decrease the number of isolated students in her classes by increasing the amount of social interaction within the group.

THE PROBLEM

The purpose of this study is to investigate some of the aspects of acquaintance and social status in physical education classes:

1. How reliable is the acquaintance test in measuring the expansiveness of an individual or group?
2. How much does the acquaintance volume increase over a period of six weeks in the physical education classes tested?

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* An abstract of a thesis for the master of science degree presented at the University of California at Los Angeles, August, 1947.

3. Is there any significant difference between the increase in the acquaintance volume of the volleyball, dance, or swimming classes?

4. What is the relationship between the acquaintance volume of an individual and her social status in the class? Social status will be based on the criteria of skill and friendship.

6. Is there a decrease in the number of isolated girls or an increase in the number of social leaders in the physical education classes after a period of six weeks?

DEFINITION OF TERMS

Sociometry is the science of the human group and the study of the interaction of people.

The *acquaintance volume* is the number of students with whom an individual is acquainted at any one time.

The *expansiveness* of an individual is the extent to which the volume of acquaintance is enlarged over a period of time.

The *acquaintance test* requires that an individual list the names of all the persons in the group with whom she is acquainted. This indicates not only her present acquaintance volume (the number of people she knows), but also the number who know her and which can be determined. When the test is given again after a lapse of time, it can indicate the expansiveness of an individual or group in making or retaining contacts.

The *sociometric test* is an instrument to measure the amount of organization shown by groups. This questionnaire asks that an individual choose his associates for any group of which he is or might become a member. By taking the results of the group and computing the number of times each individual is chosen as an associate, it is possible to determine the place of each individual in the group. This place is her social status since status is the degree of acceptance of a person by his associates in a particular group. In the sociometric test used in this study, social status is based on the criteria of skill and friendship, and the extent to which a girl is highly chosen or infrequently chosen as a friend, or as a skilled member of a team determines the position or status of this person in the class.

RELATED STUDIES

The importance of interpersonal relations within groups has long been established by the pioneering work of Moreno (23) and Jennings (17). Many sociologists such as Bronfenbrenner (8), Franz (13), Zeleny (32), and others have contributed to the refinement and extension of the sociometric technique.

The sociometric method has been modified for use in a variety of situations, Bonney (5), Loeb (21), and Potashin (27) in the grade school; Northway (24) and Van Dyne (30) in summer

camps; and Cologne (9) in community problems. Criswell (10) and Raths and Schweickert (28) have made studies concerning racial cleavage, and a study on social class and friendship was investigated by Havighurst and Janke (15).

Some studies on children's friendship relationships have been made by Seagoe (29), Partridge (26), and Ames (1). Studies on adult friendships have been made by Vreeland and Corey (31), Barker (3), and Bergler (4).

Social acceptance has been investigated by Jastrak (16), Jones (19), Dimock (11), and Doty (12). The effects of isolation on personality have been given attention by Atkin and Riggs (2), Jennings (18), and Northway (25).

In the field of physical education, there has been very little done with objective measurement of the social values of participation. The Behavior Frequency Chart devised by McCloy (22) and later improved by Blanchard (6) was not a highly reliable method of charting the behavior of students.

Breck (7) used an adaptation of the Moreno sociometric test to determine the reliability of four methods of scoring social status based on skill and friendship in physical education classes. Frost (14) used the same technique to determine whether or not skill in the French and Cooper Repeated Volleys Test was a factor in the choice of teammates and friends in volleyball classes.

These studies deserve the attention of physical educators in that they serve to suggest methods by which problems in the field of physical education might be attacked.

PROCEDURE

Three hundred and twenty-six freshmen and sophomore women enrolled in physical education classes at the University of California at Los Angeles were used as subjects. Four swimming classes, four dance classes, and three volleyball classes were picked at random representing individual, team, and rhythmic-type activities. Classes met three times a week for a period of sixteen weeks. Instructors were asked to make a definite attempt to have their students become well acquainted with each other using any method they desired. During the sixth week of classes, the acquaintance test and the sociometric test were administered, and six weeks later the tests were given a second time. The subjects were not told the purpose of the tests nor that they would be tested a second time.

On the acquaintance test, each girl was asked to indicate the names of persons in her class with whom she was familiar at the time. The number of students whom a girl knew was an indication of her acquaintance volume. A reliability of $.93 \pm .004$ was found for this test. The expansiveness of an individual was found by determin-

ing the extent to which the volume of acquaintance was enlarged over a period of six weeks.

Moreno's sociometric test was adapted for physical education classes by Breck (7). The questionnaire asked each subject to print in order of preference the names of five girls she would most prefer to have as members of her team on the basis of skill and those five she would least like to have on her team. In addition, she was asked to print the names of the girls she would most prefer to have as friends and the five she would least like to have as friends. Breck found a reliability of .894±.01 on the skill scores and .79±.01 for friendship scores. The number of choices received by the student minus the rejections by classmates was selected as the method to score social status in this study. The number of choices received by each student on the basis of friendship constituted her social acceptance score. Those girls with the highest scores were termed social leaders, and isolates were all those girls chosen as friends by not more than one other person in class.

RESULTS AND INTERPRETATION

The results of the six questions raised in this study are as follows:

1. How reliable is the acquaintance test in measuring the expansiveness of an individual or group? A coefficient of correlation (Product Moment Method) resulted in a reliability of .93±.004.

2. How much does the acquaintance volume increase over a period of six weeks in the classes tested? Since most girls enter a physical education class in which they are totally unacquainted, or know few other students, it is possible to gauge the relative growth of the volume of acquaintance of each individual in the class.

In the dance classes there was an increase from a mean of 8.07 to 15.71; in the swimming classes, from 7.82 to 14.40; and in the volleyball classes, from 10.21 to 18.17. The mean increases for all classes (326 cases) was 8.14.

The results show that in the classes tested, the acquaintance volume, and hence the volume of social interaction, was almost doubled over a period of six weeks in each type of activity.

3. Is there any significant difference between the increase in the acquaintance volume of the volleyball, dance, or swimming classes? The difference between the means of the dance and the swimming classes was not significant in the first administration of the test. The mean of the dance classes was significantly larger (at the .02 level of confidence) than the mean of the swimming classes on the second administration of the test.

In both administrations of the test, the mean of the acquaintance

scores for the volleyball classes were significantly larger than the means of the swimming and dance classes.

The results show that the students in volleyball classes become acquainted with a greater number of students in their classes than girls in the swimming and dance classes. It may be that in comparatively large classes the individual is offered more chances for making acquaintances within their limits. This difference may also indicate that students do not become acquainted as easily in individual-type activities as they do in team-type activities.

4. What is the relationship between the number of classmates a girl knows and the number who know her? The coefficient of correlation for all 326 subjects between a student's acquaintance volume and the number of classmates who know her was $.68 \pm .02$ on the first test and $.54 \pm .02$ on the second test. There is evident a positive and reliable relationship.

If the amount of the volume of acquaintance can be enlarged, the increased social interaction will probably result in more friendships being formed. Since it has been shown in other studies that having friends within the group results in a feeling of greater personal security on the part of the students, the teacher can do much toward social adjustment by increasing social interaction in her classes.

5. What is the relationship between the acquaintance volume of an individual and her status on the basis of the extent to which she is chosen as a teammate and as a friend?

The correlation between the number of girls with whom the subject is acquainted and the extent to which she is chosen as a teammate was $.11 \pm .03$ on Test I and $.14 \pm .03$ on Test II. The findings indicate that there is little, if any, relationship between the two measures. This means that the number of classmates a girl knows will have no bearing on the extent to which she is chosen as a member of a team.

The coefficient of correlation for the acquaintance volume and the extent to which a girl is chosen as a friend was $.21 \pm .03$ on Test I and $.26 \pm .03$ on Test II. This indicates a small positive relationship between the number of girls a student knows and the degree to which she is chosen as a friend.

6. Is there a decrease in the number of isolated girls, or an increase in the number of social leaders, after a period of six weeks? The number of times each individual was chosen as a friend by her classmates constituted her social acceptance score. The higher her score, the higher her rank in the class.

Forty-eight percent of the 326 girls tested received three or more choices on Test I. Twenty-six percent of the girls received one or no friendship choices from their classmates and they were termed iso-

lates. The social leaders represented 8.2 percent of the total number of girls.

On Test II only 19.6 percent of the girls were isolates and 12.8 percent were frequently chosen. The results show that there was a decided decrease in the number of girls who were considered isolated in the class after a period of six weeks and there was an increase in the number of frequently chosen girls.

CONCLUSIONS

We know that the direct relations a person may enter into depend, obviously, upon the acquaintances he actually has and this will determine the amount of group interaction that takes place. Heretofore, it has not been known to what extent social interaction is increased by activity classes. It has been shown in this study that by placing emphasis on having students become acquainted with each other as early in the semester as possible, the volume of social interaction over a period of six weeks almost doubled in all classes regardless of the type of activity. By means of a control group, further research in this area might show whether or not the same results would have been obtained without a conscious effort on the part of the instructor to increase social participation.

Becoming acquainted marks the beginning of that complicated interaction among peoples which involves social adjustment. Inasmuch as social adjustment implies social acceptance by classmates and associates, the results of this study are significant. It has been shown that there is a definite relationship between the number of classmates a girl knows and the number who know her. In attempting to increase social interaction in her classes, the physical education teacher is helping her students to become better socially adjusted individuals.

It has also been shown in this paper that the number of social isolates decreases as the members of the group become better acquainted. Even though each girl tended to maintain her relative position within the group, the class as a whole improved in position. There were fewer isolates and more social leaders after six weeks, and many of those who were isolated or not accepted by the group toward the beginning of the semester were accepted at the time of the second test. This may be attributed to the increased social participation since "leadership and isolation," as Jennings found, "are products of interpersonal interaction rather than attributes of persons." (17).

Although many studies have shown that it is very difficult to change the total impression which a person makes upon his group, it is evident that changes in status are possible. Perhaps there would be even more change in status if we attempted to improve human

relations in classes through better guidance in the development of social attitudes.

More studies are needed in our field to investigate ways in which status can be changed, the effects of various methods of teaching on social behavior, and the guidance techniques best suited for our use. We need to study ways in which social participation can be increased in individual-type activities, and experiments might be conducted to show that more is accomplished in physical education classes with increased social participation.

Sociometry has made many important contributions in its study of human relationships and we, as educators, can learn much from this field in attempting to increase the effectiveness of our teaching in physical education.

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Medical Research in Physical Education in South Africa

REPORTED BY ERNST JOKL, M. D.

Union Education Department

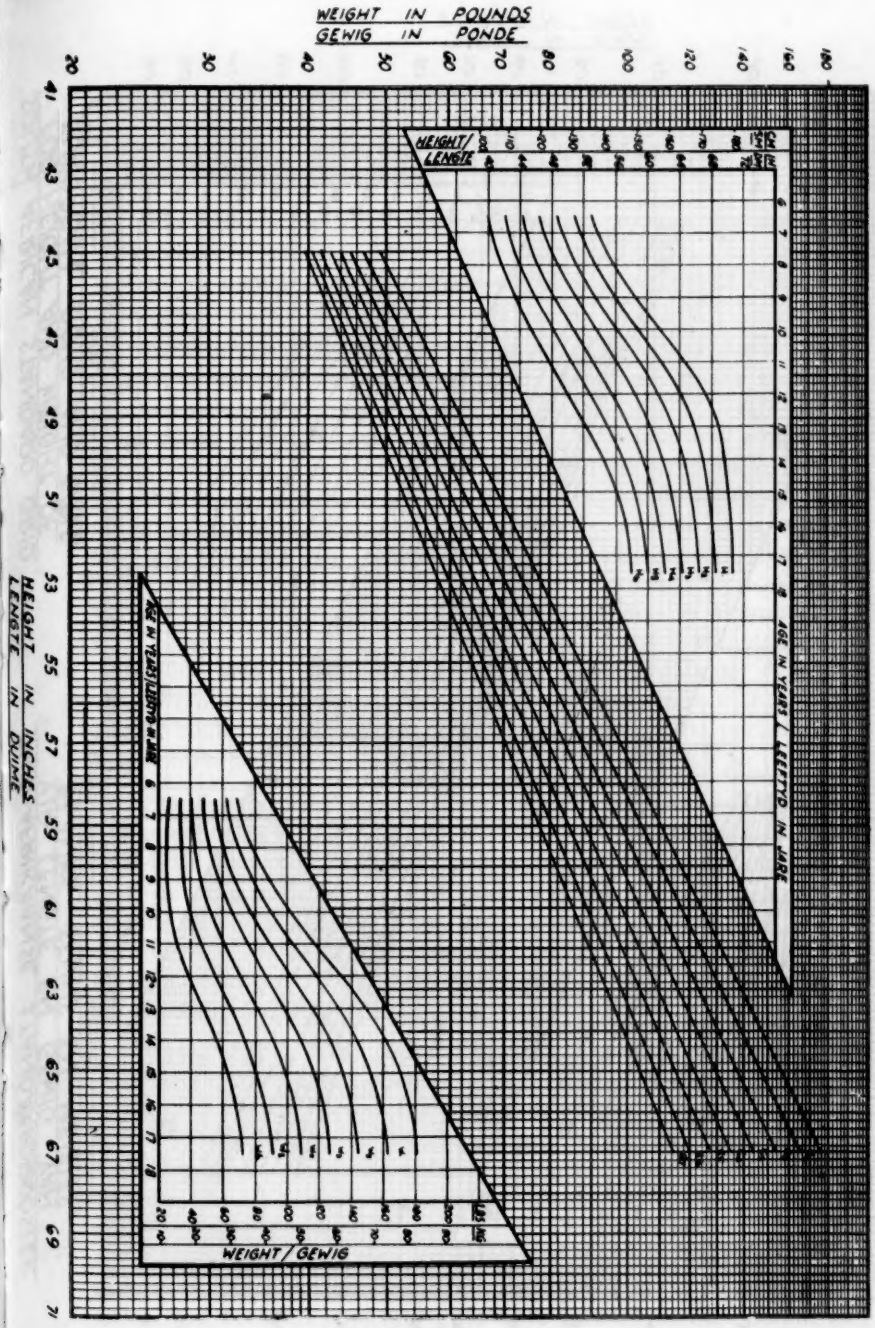
Pretoria, South Africa

(Submitted for publication September, 1947)

A NATIONAL scheme of physical education was launched in South Africa in 1938 when the Cabinet decided, in accordance with a general desire which had been evinced in the country, to accept the recommendations made in a memorandum submitted by the South African Olympic and British Empire Games Council to appoint a National Advisory Council for Physical Education. This Council functions under the Minister of Education. It consists of the heads of the Central and Provincial Education Departments; of the Departments of Public Health, Social Welfare, Defence, Native Affairs, and Railways and Harbours; of representatives of the United Municipal Executive of South Africa and of the South African Olympic and British Empire Games Association; of the Technical Adviser to the Council, and of three members appointed in their personal capacity, namely Dr. R. W. Wilcox, Dr. E. H. Cluver and the author who is now Physical Education Research Officer in the Ministry of Education.

Since its inception the Council has conducted such medical research as pertains to the subject. Many of the results of this research are being published in the government journal *Manpower*. A comprehensive report on the Council's research work has recently been made available (37). It is divided into six parts. The first deals with tests conducted with the aim of establishing standard grids of growth, crude physical efficiency,* and health. Secondly, three studies of comparative anthropometry are summarized. Thirdly, an account is given of investigations in which a number of interrelations of health, growth, and efficiency were analyzed. Fourthly, evidence on the problem of conservation of human resources is reviewed. Fifthly, clinical observations regarding the interdependence between fitness and health are discussed. The sixth part of the report is concerned with a summary of four concepts developed from data collected by the committee, *viz.* of specificity of fitness, medical theory of gymnastics, physique and character, and adaptation energy. The following is a brief summary of the original report.

* This is in contrast to individual fitness screen tests which of course must be made more sensitive and therefore more highly differentiated.


WEIGHT IN POUNDS
GEWIG IN PONDE
HEIGHT/LENGTE
AGE IN YEARS / LEEFTYD IN JARE
WEIGHT / GEWIG
HEIGHT / LENGTE IN INCHES / LENGTE IN DUIME

SOUTH AFRICAN STANDARD GRID FOR HEIGHT AND WEIGHT OF EUROPEAN GIRLS.

SUID AFRIKAANSE STANDAARDROOSTER VIR LENGTE EN GEWIG VAN BLANKE MEISIES.

Fig. 1. South African Standard Grid for Height and Weight of European Girls. The triangular insets represent smoothed age-height (above) and age-weight (below) development curves. H1 to H6, and W.1 to W.6 are growth channels for tall, medium, and short, and heavy, medium, and light girls respectively. The straight lines in the centre are drawn on logarithmic paper. They show the effect of growth on height-weight relationship. The principle according to which these lines were constructed was originally introduced by Wetzel. The results obtained from South African data vary slightly from those reported from the United States.

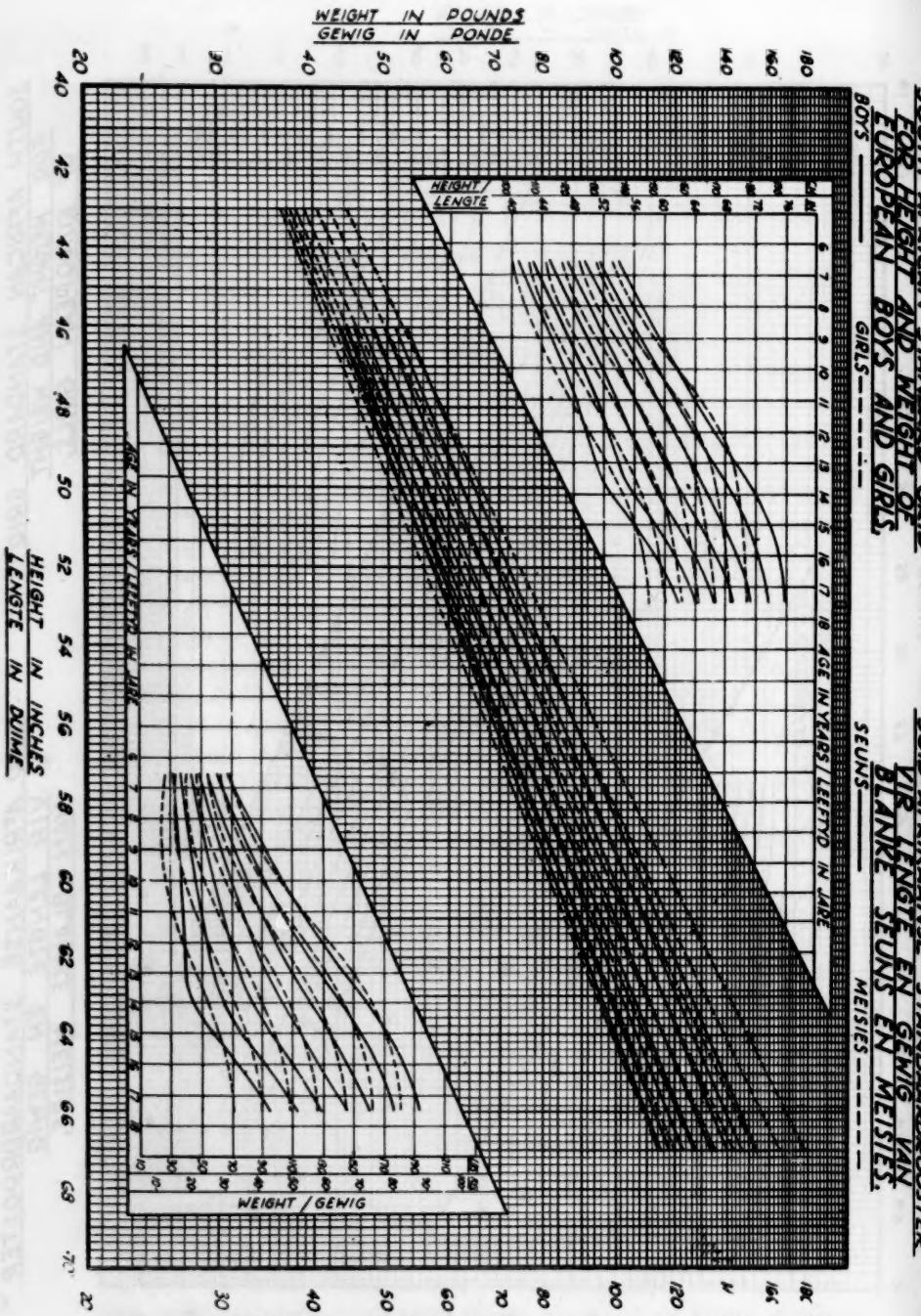

WEIGHT IN POUNDS
GEWIG IN PONDE
SOUTH AFRICAN STANDARD GRID FOR HEIGHT AND WEIGHT OF EUROPEAN BOYS AND GIRLS.
BOYS
GIRLS
SUID-AFRIKAANSE STANDAARDROOSTER VIR LENGTE EN GEWIG VAN BLANKE SEUNS EN MEISIES.
SEUNS
MEISIES
HEIGHT / LENGTE
AGE IN YEARS / LEEFTYD IN JARE
WEIGHT / GEWIG
HEIGHT IN INCHES
LENGTE IN DUIME

Fig. 2. South African Standard Grid of Height and Weight of European Boys and Girls. A grid based on the same principles applied in the evaluation of the data obtained from girls was constructed also for boys. The two standard grids were superimposed with the result that the grid patterns for both sexes can be compared. Little girls were found to be smaller and lighter than little boys. Since the puberty spurt of growth starts earlier in girls than in boys, there is a period of three years or so beginning at about age 10, when the girls' measurements temporarily surpass those of the boys.

I. STANDARD GRIDS OF GROWTH, PHYSICAL EFFICIENCY, AND HEALTH

The Committee tried to evolve methods to measure the health of population groups. Three components of health have been investigated, namely, growth, crude physical efficiency and incidence of illness.

Growth Grids.—With a view to establishing standards and to evaluating measurements of growth, more than 25,000 individual measurements of school children between 6 and 18 years of age were taken. On the basis of this material a height and weight grid was constructed which allows the judgment of physique of groups of children in quantitative terms, to predict trends of development of individuals and groups of boys and girls, as well as to compare any set of data with corresponding evidence collected elsewhere. The Committee wishes to acknowledge its debt to the work of N. C. Wetzel whose logarithmic height-weight channels represent a distinct advance in the study of growth (41). It was found appropriate to include also growth grids (7) from which individual data, distribution of group measurements, and rates of progress of height and weight could be assessed for the various ages of the period under review (see triangular insets in Fig. 1; reference No. 7).

Standard growth patterns were found to represent secondary sex characteristics (Fig. 2). Little girls already are smaller and lighter than little boys. The puberty spurt of growth starts earlier in girls than in boys and therefore one finds a period of 3 years or so, beginning at about age 10, when girls are slightly taller and heavier than boys. The latter make good the lost ground, however, as soon as they begin to mature. Between 17 and 18 they are 4 to 6 inches taller and 15 to 25 pounds heavier than girls (8).

Physical Efficiency Grids.—Statistical methods similar to those employed in the construction of growth grids were used to prepare standard grids of crude physical efficiency based upon the results of about 27,000 individual performance tests of 100- and 600-yard dashes, and of putting the 12-lb. shot conducted with boys and girls of 6-18 years. These grids revealed distant physiological trends of growth of speed, endurance, and strength. Comparison of the standard grids for boys and girls indicated that physical efficiency too is a secondary sex characteristic (Fig. 3a, 3b, 3c). The performance differences between boys and girls were greatest in the shotput and smallest in the 600-yard race between ages 6 and 13. There was, however, a sharp decline in the performance of the girls after age 13 (Fig. 3b) while the boys' running times continued to improve steadily. Generally, athletic standards of the boys were superior to those of the girls before puberty. But throughout the 6-16-year age

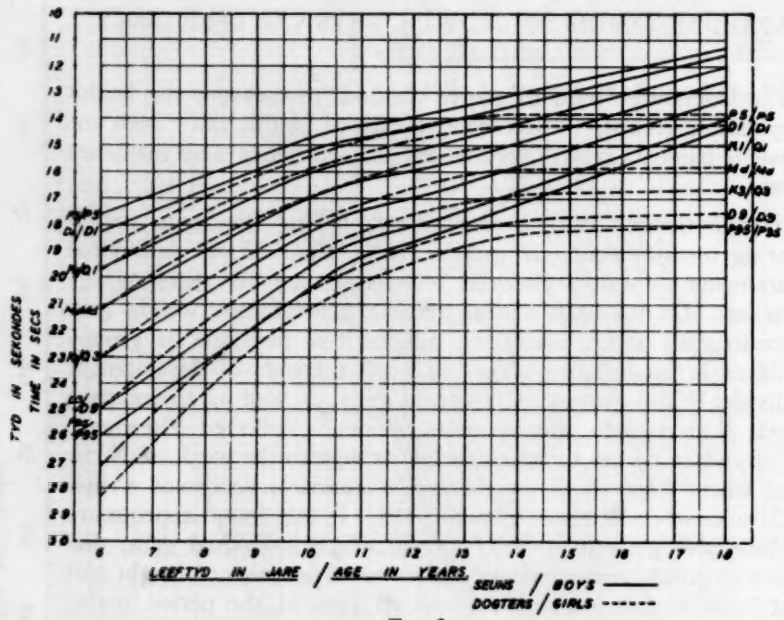
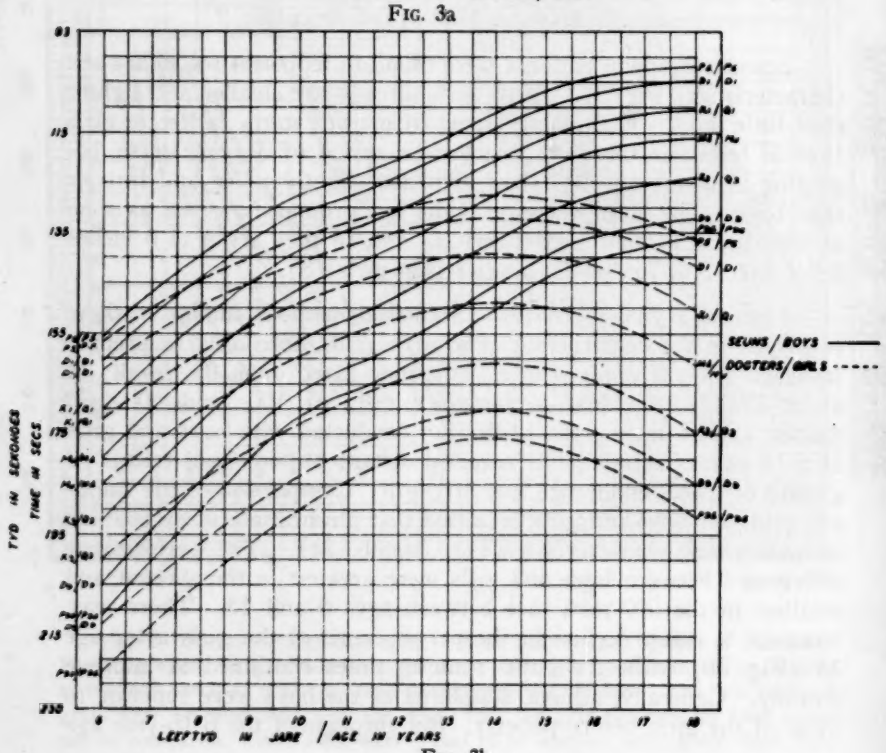

TYD IN SEKONDES
TIME IN SECS
LEEFTYD IN JARE / AGE IN YEARS
SEUNS / BOYS
DOGTERS / GIRLS

FIG. 3a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LEEFTYD IN JARE / AGE IN YEARS
SEUNS / BOYS
DOGTERS / GIRLS

FIG. 3b

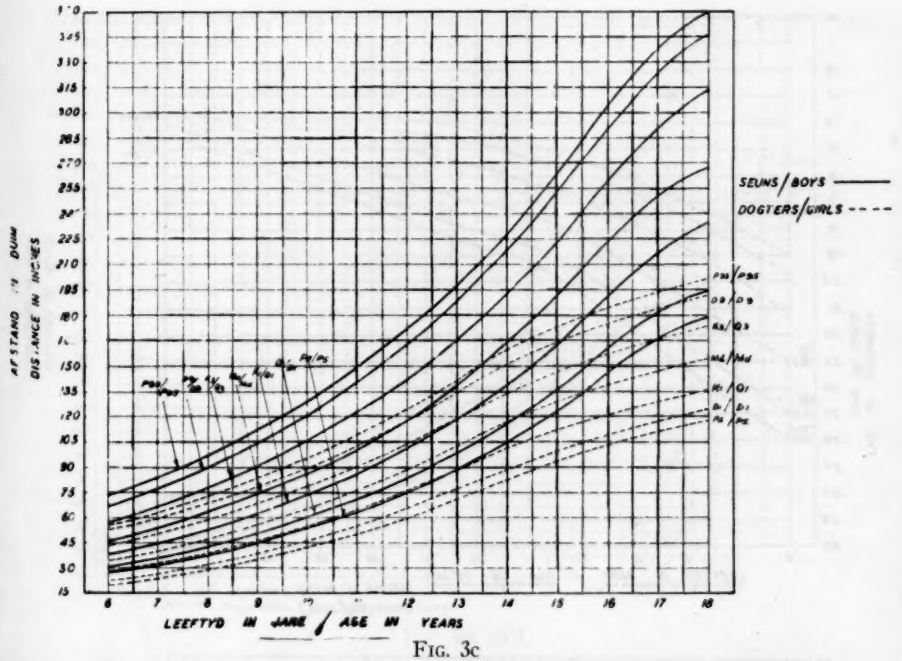


FIG. 3c

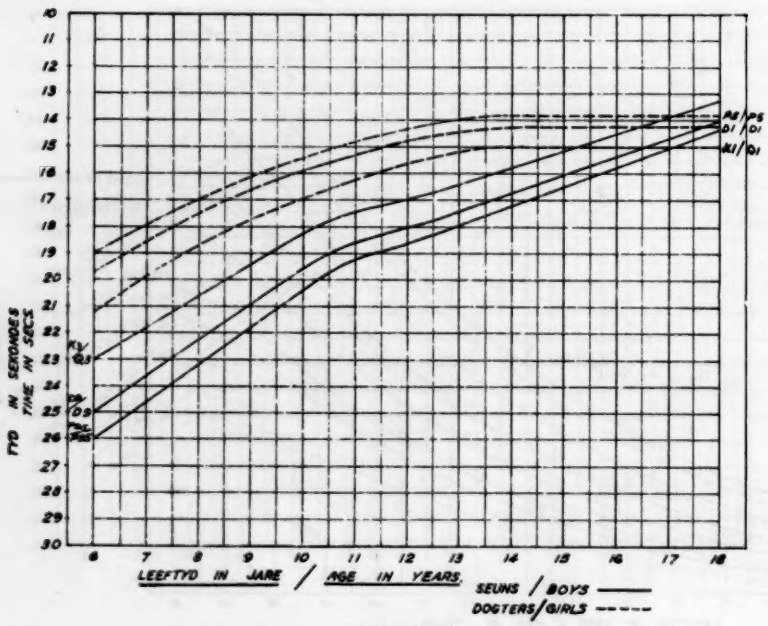
Fig. 3a, b, c. South African Standard Grids of Crude Physical Efficiency Elaborated from the Results of about 27,000 Individual Tests of 100 and 600 Yards Running and of Putting the 12 lb. Shot Conducted with Boys and Girls of 6 to 18 Years. Md connotes median and Q quartile. Inside the area between Md and Q1 lie ¼ of all performances, while another ¼ lies between Md and Q3. Between Q1 and Q3 therefore are spread ½ of all individual performances. Between Md and D1 (D stands for decile) 40 per cent of all performances are situated, while another 40 per cent lie between Md and D9. Thus, between D1 and D9 lie 80 per cent of all results. P is percentile. With the exception of the 5 per cent representing the most outstanding and the poorest performances respectively, 90 per cent of all performances are therefore charted between the top and bottom line of the grids.

Standard performance grids were constructed for boys and girls. Superimposition of the two grids demonstrates the extent to which physical efficiency is a secondary sex characteristic. The most striking incongruity of patterns of development was encountered in respect to the 600-yard race. Also it is noteworthy that prior to puberty already performance standards of the boys are superior to those of the girls.

period physical efficiency standards of the best girl performers were invariably superior to those of the poorest performers among the boys (13; Fig. 4a, 4b, 4c).

High Standard of Physical Efficiency of Bantu.—Statistical evaluation of the above described physical efficiency tests with Bantu, Chinese, colored,* European, and Indian children showed that gen-

* This term is used in South Africa with reference to persons of mixed racial backgrounds.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SEUNS / BOYS
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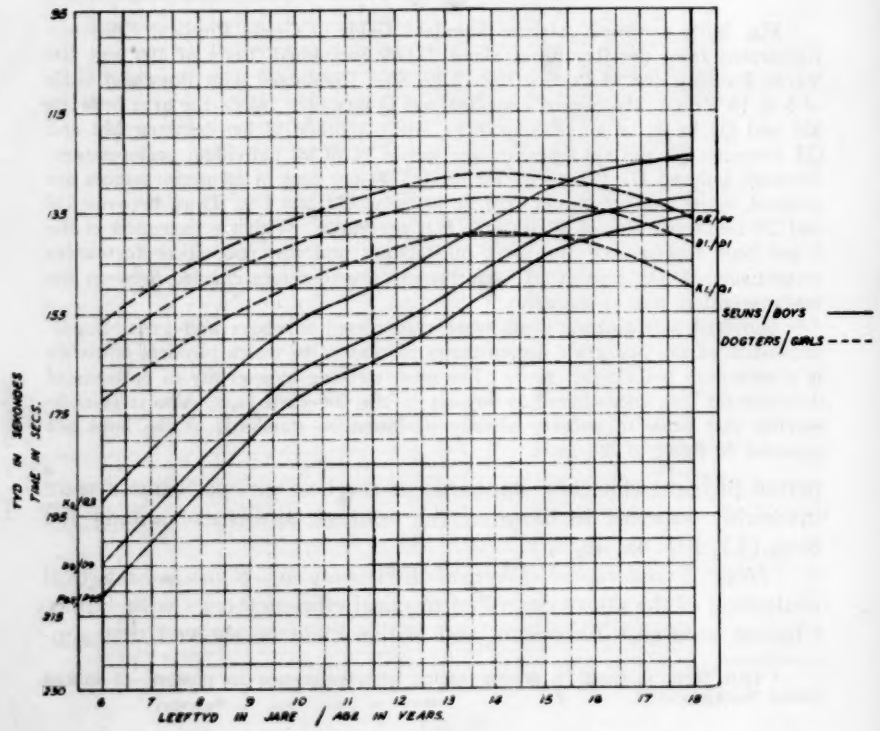
FIG. 4a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SEUNS/BOYS
DOGTERS/GIRLS

FIG. 4b

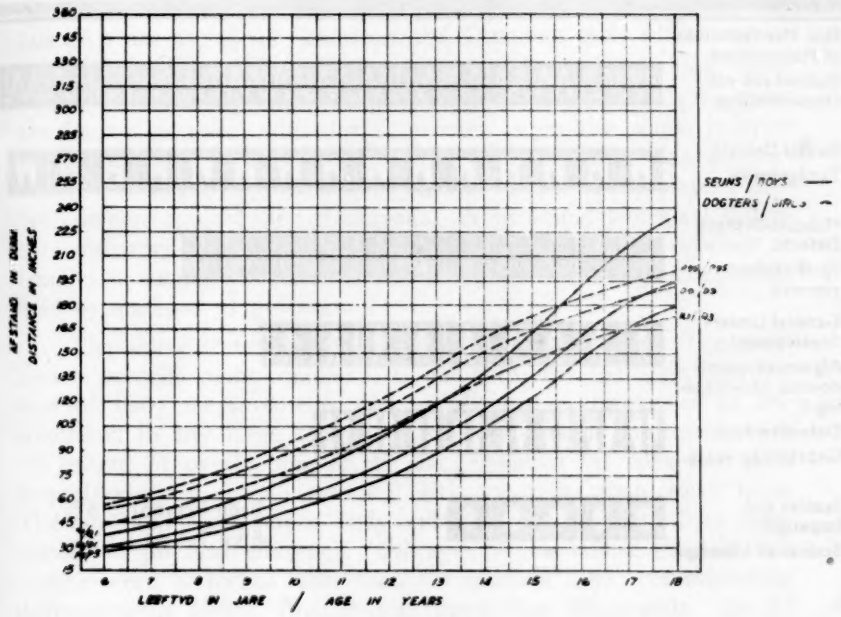

FIG. 4c

Fig. 4a, b, c. Comparison Between Weakest Boys' and Best Girls' Performances. Plotting of P.95, D.9, and Q.3 of the boys and of P.5, D.1, and Q.1, of the girls' grids allowed a comparison between the weakest boys' and the best girls' performances. Almost throughout school age the best girl performers beat the weakest athletes among the boys.

erally the Bantu possesses a superior performance capacity. We found that this superiority was greater in the case of the girls than it was in the case of the boys. Further studies were conducted to test the validity of this finding. The Committee is satisfied with the evidence to the effect that the Bantu is distinguished by a high standard of physical efficiency and heat resistance (6, 24, 30).

Health Grids.—An original method was used to record the results of medical examinations. This method is based upon a clinical analysis of such morphological and functional features as are present in healthy subjects. Common deviations from the normal have been specified according to current physiological and pathological concepts, appropriately termed and classified for diagnostic purposes. The physician in charge of group health surveys conducted with this method simply indicates for every individual the presence or absence respectively of such normal or abnormal features as are detailed on the prescribed form. It is thus possible to arrive at quantitative conclusions regarding the incidence of any of the conditions listed in the examination record sheet (34).

The health grid was used in several sample surveys in which

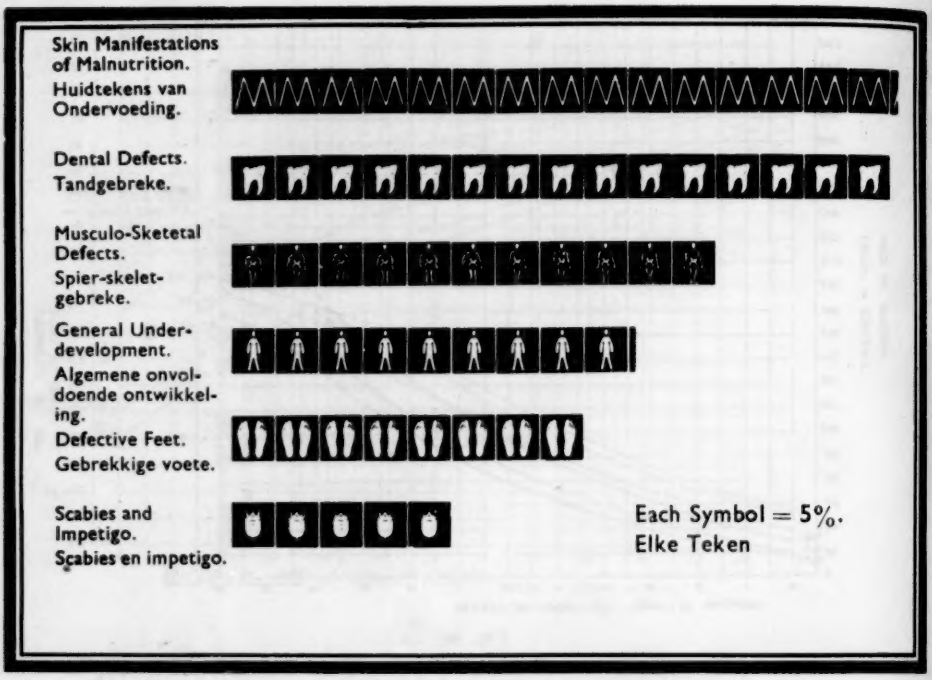

Fig. 5. Incidence of Remediable Illnesses in Sample of European School Children 6-7 Years of Age. Graphic presentation of results of clinical examination of 150 school-going children, age 6. Most of the medical disabilities shown in the graph are remediable; malnutrition is probably the most important single pathogenetic factor.

attempts were made to measure the incidence of disease among school youths. It was found that the bulk of the diseases that were thus found were of a remediable nature; that most of those medical disabilities which are known to be present in a large percentage of adolescents are almost fully established as early as at age 6 (Fig. 5); that the most important pathogenetic factors revealed in these surveys were nutritional; and that even in the absence of other forms of medical treatment, the introduction of a daily school meal is of considerable therapeutic value (31).

II. COMPARATIVE ANTHROPOMETRY

The Physique of American, Canadian, English, and South African Children.—With the help of the standard grids of growth of South African school children, anthropometric data obtained in America, Canada, England, and South Africa were compared. In respect to height and weight, South African children between 6 and 15 years of age are on the whole heavier than American, Canadian, and English children. In regard to height, a consistent and signifi-

cant superiority of the South African boys was found. South African girls are as tall as American and Canadian girls (10).

Women and Men in Sport.—Although many individual cases of women attaining extraordinary performance standards in sport are known, physical efficiency of women is on the whole inferior to that of men. All athletic records for men are better than are records for women; e.g., even the greatest women tennis players cannot compete against men champions. A profound biological difference underlies such observations. Male greyhounds are superior to females in racing competitions and all speed records for horses are held by stallions or geldings.

The above statements refer to statistical averages. The position is actually more complex. If one considers the wide distribution of body measurements and of physical performances as encountered in any large sample of children, one is impressed with the extent of overlapping of the data obtained for boys and girls respectively; e.g., at all ages tall girls are taller than small boys. The same applies to weight, body bulk, and as has already been mentioned, to physical efficiency. At age 17 the tallest girls in our sample were 10 inches taller than the smallest boys; corresponding differences in weight amounted to more than 80 pounds. At 12 years of age the best girl athletes put the 12 lb. shot 135 inches as against 75 inches attained by the poorest boy performers; outstanding girl runners covered the 600-yard distance in 130 seconds, while more than 3 percent of the boys required 163 seconds for the same feat; the corresponding running times in the 100-yard race were 14.4 seconds for the good girl performers and 18.6 seconds for the bad boy performers. Altogether, the upper third of any large sample of girls between 6 and 16 years of age may be expected to beat the lower third of the boys' sample.

It would be erroneous to assume from evidence of the kind cited that women's motor performances are categorically inferior to those of men. After all, competitive sports and athletics are typically male pastimes and to judge women on a scale which *ex hypothesi* is made for men is not fair. So far as motor activities are concerned which involve the expressive as well as the achievement aspect, different results are obtained. In entire sections of physical education, e.g., eurhythmics and dancing, the female sex reigns supreme. In studying the spontaneous play activities of children 6-7 years of age, one finds that at that early stage of development already girls show more interest in spending their time with dolls, sewing, and threading beads than playing croquet, solving puzzles, or constructing buildings from blocks (33).

Training and Physique of Adolescent Boys.—A statistical evaluation was undertaken of 1,067 growth records of physically sub-

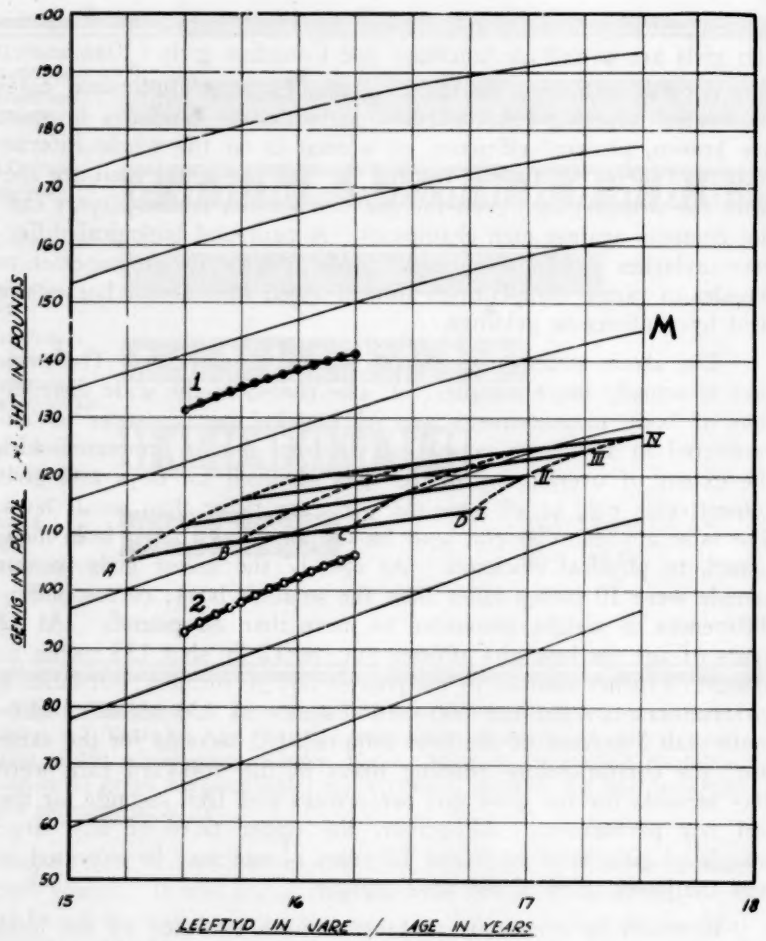

Fig. 6. Training and Physique of Adolescent Boys. Statistical grid evaluation of 1,067 growth records of physically sub-standard adolescent boys at rehabilitation battalion (Physical Training Brigade) at Roberts Heights.

The South African weight grid for boys serves as a ground pattern. Line A-D indicates the mean weights of four units of young boys aged 15 years 3 months (A), 15 years 9 months (B), 16 years 3 months (C), and 16 years 9 months (D) respectively. Comparison of line A-D with the mean (M) line of the South African standard grid reveals that the weights of the boys joining the P.T.B. were below average; and that the initial weight deficiencies were greater in those who enrolled at 17 than they were in 15-year-old trainees.

The interrupted ascending lines indicate the actual weight increases of Groups A, B, C, and D during their first 9 months at Roberts Heights. Lines II, III, IV mark the rehabilitative effect of the training on the boys' physical development, after 3, 6, and 9 months, respectively. These lines must be compared with the base line AD or I. The distinct "normalizing" effect of the rehabilitative training is obvious.

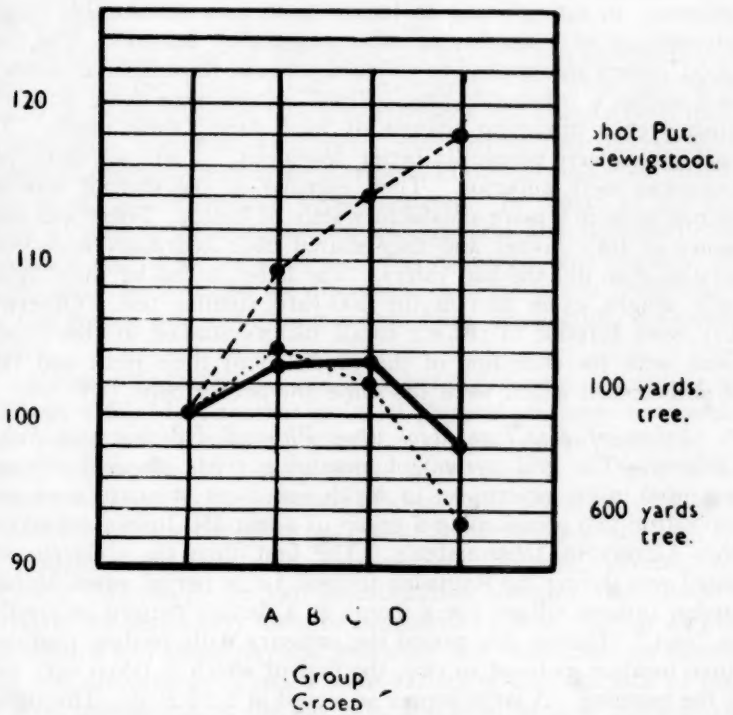

Fig 7. Body Weight as Determinator of Physical Efficiency. A, B, C, and D are bad, poor, good, and very good performances respectively in shotput, 100 and 600 yards running. On the abscissa, weight deviations are indicated on a percentage basis. It appears that high body weight aids physical performances demanding strength, while it handicaps performances of endurance and vice versa. With regard to speed, no determining effect was discovered.

standard adolescent boys studied at the Physical Training Battalion in Roberts Heights. In the original report the results of this investigation are presented in diagrammatic form. Rehabilitative training invariably exerted a beneficial effect. This effect was more marked if the training was applied early. Boys who were admitted to the Physical Training Battalion at age 15½ developed more favorably than did boys who joined the Battalion at age 17 (12; Fig. 6).

III. CORRELATION STUDIES

Body Weight as Determinator of Physical Efficiency.—Body weight is a specific determinator of efficiency. High body weight aids physical performances demanding strength while it handicaps performances of endurance, and vice versa. With regard to speed, no determinating role of body weight was discovered (26; Fig. 7).

"Good" and "Bad" Eaters. —It was demonstrated that a child's

"efficiency in eating" may be looked upon as a statistically reliable determinator of a number of other personality features. The term "good" eaters was applied to children who ate reasonable amounts of food within a reasonable time. "Bad" eaters were those unable to finish even a minimum amount of food during their meals. The good eaters were physically better developed. Their scholastic performances were superior. They excelled in the shotput test and seemed to be in a more satisfactory state of health. There was more money in their homes and they shared their bedrooms with fewer persons than did the bad eaters. The latter, aided by their lighter body weight, came first in the 600-yard running test. Otherwise they were inferior in respect to all factors studied in this experiment, with the exception of the condition of their teeth and rates of absenteeism which were the same for both groups (1).

Effect of Mid-Day Meal upon Physical Efficiency of School Children.—The grid system of measuring crude physical efficiency was used in an experiment in which our three standard tests were applied on two occasions to a group of about 150 Indian school children (boys) in Johannesburg. The first time the children were tested was during the Ramadan festival, i.e., a period when Mohammedan Indians adhere for a month to a dietary pattern referred to as "fast." During this period the ordinary daily feeding routine of three meals is reduced to two, the first of which is taken very early in the morning. A large supper is served at 6:15 P.M. Throughout the day no food or drink is taken. The second series of tests was conducted with the same children three weeks after the conclusion of the "fast." The results of the two tests were statistically evaluated. Student's t-test for small sample groups was applied, a 5 percent value of P being regarded as the level of significance. The "fast" had a significant negative effect on the 100-yard running performances. In respect to the 600-yard running test, the "fast" affected the younger children most. In respect to the shotput results, a significant retarding influence of the "fast" was noticeable in the case of the older boys. Analysis of body weight showed that the "fast" had caused a significant loss (3).

Skin Manifestations of Malnutrition, Scabies, and Impetigo.—Of 124 boys and girls 6-7 years old who were included in this analysis, only 17 had normal elastic skins. Seventy-four had cutaneous manifestations of malnutrition, while 33 children suffered from cutaneous manifestations of malnutrition as well as from impetigo and scabies. The latter children were, on the whole, inferior to the others in respect to growth, health, scholastic performances, and home environment. No differences were found in regard to rates of absenteeism. It is noteworthy that the children belonging to the healthy skin group failed to show the best physical performances, with the exception of

the shotput tests where they were aided by their heavier body weight (31).

Disease and Physical Efficiency.—Tests and measurements were taken during the Public Health Department's nutrition and health survey of Bantu children to which reference has already been made. In one study standards of physical efficiency of two representative groups (Letaba-Bochem in the Northern Transvaal, and Pietermaritzburg in Natal) of children were compared. In regard to the incidence of illness, Pietermaritzburg was the best and Bochem-Letaba the worst region so far known in this country. The physical efficiency tests revealed that the discrepancies in the health conditions of the two groups were not always reflected in corresponding differences (2).

Vitamin C Deficiency and Physical Efficiency.—A similar result was obtained in another series of physical efficiency tests which was conducted in connection with a comprehensive study of the effects of insufficient dietary intake of vitamin C. There it was found that even in the presence of considerable degrees of vitamin C deficiency, muscular efficiency may remain unimpaired (15).

Intelligence, Scholastic Performances, Growth, Health, and Physical Efficiency.—In two investigations attempts were made to correlate the personality features enumerated above. So far as basic intelligence and basic physical efficiency are concerned, no correlation was discovered. Thus, a wide variety of combinations of good or poor intelligence on the one side, and good or poor physical efficiency on the other may be present in individual cases (36). This study was supplemented by another investigation in which an analysis was presented of such changes of mental and physical performance standards of children as can be induced or influenced through social, environmental, and educational measures. A sample of 105 school children 6-7 years of age was divided into three groups in accordance with their scholastic performances. It was found that the good pupils came from economically better situated homes and that they shared their bedrooms with a significantly smaller number of persons than did the bad pupils. The good pupils were also healthier. However, little if any, differences were seen in respect to growth, physical efficiency, and rates of absenteeism (4).

Height, Weight, and Body Index.—With the same group of children tallness was found to be a distinct asset in respect to physical efficiency while shortness was a handicap. With regard to other factors tested, however, the shortest boys and girls were not at all at a disadvantage. They had well rounded chests, a good musculature, and satsfactorily developed sub-skin tissue. The short boys were also slightly more regular in their school attendance.

The children with the lowest body indices, i.e., with the lightest

weight for a given height possessed the least healthy skins as indictated by the incidence of nutritional deficiencies and of scabies and impetigo. For the type of boy and girl studied in this investigation, tallness proved to be an all-round asset in athletics only if it was associated with good body bulk (9).

Menarche, Growth, and Physical Efficiency.—An analysis was made of anthropometric measurements and functional performances of a socially homogeneous sample of 40 school girls of 13 years of age. Of these, 20 were in the pre-menarcheal state (M—), while the other 20 had started to menstruate (M+). Student's t-test was used to determine statistical significance of differences.

The M+ girls were taller, heavier, and more bulky. The differences were equivalent to about 1½ years of cross-sectional growth at the age period under review as evaluation of the results on the grids revealed. Although it is not as marked as in the case of weight, the correlation between menarche and height is noteworthy since even the powerful developmental stimulus of physical training does not appreciably affect growth in height. The M+ group surpassed the M— group in the shotput and in other performances demanding strength, while the opposite result was found in the 600-yard running race. At puberty girls become stronger, but their endurance deteriorates, while their sprinting performances remain virtually unchanged. Menarche rather than chronological age determined the onset of the alterations referred to (32).

IV. CONSERVATION OF HUMAN RESOURCES

The presence of large numbers of men and women of such social, intellectual, cultural, physical, and economic standards as preclude them from leading a satisfactory life has caused much concern in South Africa. Many responsible persons believed that this problem was due to a progressive process of biological degeneration and that remedial action on a comprehensive scale was impossible.

In 1933 the Government of the Union of South Africa introduced the Special Service Battalion "for the purpose," as was officially stated, "of combating the deteriorating influences of unemployment and of providing discipline and training for unemployed boys and young men." Members of the Committee have conducted extensive scientific studies to ascertain to what extent the favorable living conditions and other measures provided in the educational camp in which the boys lived were able to exert a rehabilitative influence. This research work has borne rich fruit. The bulk of the physiological evidence on rehabilitation of sub-standard youths so far as it has been collected by the Committee has been presented in a monograph, *Training and Efficiency,* published in 1941 by the South African Institute for Medical Research (18). Some of the findings were

unexpected; e.g., the majority of those youths who in their poor home environment could not attain certain minimum educational standards, were able to do so in the camp where the scholastic methods that were employed did not fundamentally differ from those which had previously failed to attain their object; that moral attitudes, wherever they had been at fault, improved; that the remarkable progress in the youths' physical development, fitness, and discipline was accompanied by a new and better social outlook. An important aspect of the development in the young men's physical efficiency that took place while they were in the camp school was that it enabled them to participate in wholesome recreation. What this change implied with regard to the boys' outlook on life will be appreciated if it is realized that most of them had been unable to sing a song or to play a game at the time they joined the camp school.

V. CLINICAL OBSERVATIONS

Indisposition after Running.—Several studies of the physiological mechanisms by which physical performances are limited were undertaken. A description was given of a clinical syndrome which is distinguished by nausea, vomiting, sweating, and profound weakness. It frequently affects runners after strenuous performances of brief duration and represents a short-lived and harmless occurrence, notwithstanding the alarming impression it frequently creates (19).

Heart and Sport.—In the course of their studies of physiological limitations of muscular performances, the investigators' attention was drawn to cardiological problems of athletics. No cases were encountered in which cardiac damage was caused by physical effort. This observation seemed in itself noteworthy in view of the widely held opinion that hearts may become overstrained through exercise. That such a concept is far from the truth was clearly demonstrated when several cases were discovered of outstanding athletes who were afflicted with valvular disease of the heart (27).

In 1940 a study was completed of pathological findings in 61 cases where death had occurred in association with physical effort. It was found that cardiac disease even if so severe as to acutely threaten life does not necessarily prevent the subject thus afflicted from remaining in full possession of his physical strength up to the time of his death. Among the cases analyzed in the above series were that of an international football player with a persistent active thymus gland who died a few minutes after a game; that of a small boy with advanced coronary sclerosis who died after a three-round regulation boxing fight (25); and that of a young woman with congenital subaortic stenosis who died after having danced for three hours.

The following conditions, arranged in order of frequency, were found at autopsy of subjects who had been capable of considerable

physical effort at the time they died: (1) coronary artery disease; (2) acute coronary occlusion; (3) degenerative disease of heart muscle; (4) ruptured aneurysm of aorta; (5) chronic inflammatory disease of heart muscle; (6) ruptured aneurysm of cerebral arteries, usually congenital; (7) rupture of heart; (8) rupture of congenitally diseased aorta; (9) developmental abnormalities of the heart; (10) developmental hypoplasia of entire arterial system.

The question has now arisen whether the traditional insistence by physicians on prolonged rest in cases of heart disease can still be considered universally justified. Thomas and Harrison have presented experimental evidence to the effect that limitation of muscular movements is distinctly injurious to animals recovering from experimentally produced myocardial injury. When the spontaneous activity of their rats was studied by the use of the optional treadmill, the authors found that most of the animals voluntarily chose to take as much exercise per day as do rats with uninjured hearts. Even strenuous muscular exercise (enforced swimming) did not cause any significant increase of the rate of mortality of the convalescent animals. The question of use and abuse of bed rest in cardiac patients was recently discussed by Dock and by Harrison, both of whom consider a revision of the present therapeutic concepts in cardiology overdue (14, 39). What seems to be necessary at this stage is to conduct quantitative studies of exercise tolerance, a valuable pointer with regard to therapy, as well as long-term case observations, with separate analyses of the results obtained for the main categories of heart disease. It is significant that, in the list of those pathological conditions which have been observed in athletes, a considerable number of diagnostic entities known to every experienced cardiologist are conspicuous by their absence. On the other hand, reports are available of athletes whose physical efficiency was greatly curtailed due to the presence of heart disase. In some of these cases continuation of exercise activities, against medical advice, exerted a distinctly unfavorable effect upon the course of the illness (17).

Hypoplasia and Maldevelopment of Arterial System Associated with Persistent Thymus, Hypertrophy of Lymphoid Tissue, and Renal Dysplasia.—Four cases of sudden death in young, healthy, physically active adults, one of them the captain of the South African Sprinkbok Rugby team, were studied post mortem in which the syndrome mentioned in the above heading was found. The discovery of a fourth component to the previously known pathological triad typical of the status thymus lymphaticus as specified in the heading of this paragraph is of interest. In one of our cases there was seen a small left kidney (62 gm.) which was the seat of advanced hydronephrosis, while the right kidney was hypertrophied (330 gm.).

In two of the other cases of this series a double renal artery was found on the right side. Additional pathological changes were present, e.g., hypertrophy and patchy fibrotic degeneration of the myocardium; and under-development and/or atheromatous changes of the coronary artery.

Delayed Rheumatic Fever Following Athletic Trauma.—Two cases were studied of young athletes of outstanding ability in which sport injuries to joints mobilized latent rheumatic infection. A few days after having received a kick against his right hip a football player, age 17, fell acutely ill with high temperature, became delirious, and died. Autopsy revealed a hypertrophied left ventricle and a fresh, large, crumbling thrombotic mass protruding from the ventricular surface of the anterior curtain of the mitral valve. On examination a small ruptured aneurysm was found beneath the thrombus that was attached to the valve. The second case was that of a racing cyclist, age 21, who fell during a training ride and hurt his left knee which event was followed by acute rheumatic fever. This disease permanently incapacitated his heart muscle and caused insufficiency of the mitral valve.

Other Case Studies.—Further clinical observations in which high standards of athletic efficiency were maintained in the presence of pathological conditions of various kinds have been placed on record. As a result of a severe war injury, a former gymnastic champion of South Africa had to undergo an extensive thoracoplastic operation, which was followed by a long and eventful period of convalescence. Although his left shoulder and his thorax were thus permanently impaired, he soon took up his gymnastic training and almost completely regained, within a year's time, his prewar standard of physical efficiency.

A successful shotputter and a well known pole vaulter were in no way handicapped by the fact that they had been born without their major pectoral muscles (16). Observations of extraordinary degrees of athletic prowess were made in subjects afflicted with organic diseases of the central nervous system, with metabolic and endocrine disturbances, and with orthopedic and other disabilities (11).

VI. THEORIES

Specificity of Fitness.—The term "fitness" has in the past been used in a rather indefinite manner. From the scientific point of view this is unsatisfactory since manifold experiences prove that a person can be fit only in respect to a limited number of tasks. This statement applies to physical as well as to other aspects of human achievements. Certain individuals are capable of excelling in a variety of fields, intellectual, physical, and otherwise, but generally speaking, the scope of human fitness is limited. A very intelligent person is not necessarily musical, and vice versa. A strong man is

unlikely to possess a high degree of endurance. The fact that a woman is a brilliant pianist or juggler does not necessarily indicate that she is strong or clever. Several legless men have become fighter pilots. Chopin wrote some of his best music when he was suffering from tuberculosis and one of the greatest presidents of the United States was paralyzed. The famous philosophers, Moses Mendelssohn and Emmanuel Kant, were hunchbacked dwarfs, while the Zulu King Chaka and Genghis Khan were magnificent physical specimens. The complex of problems raised by observations of this kind is of importance to physical education, insofar as the term fitness is applicable to the subject. The theory under review has clarified the issue by insisting that the term "fitness" is of scientific significance only if it is applied to specified fields of human endeavor (21).

Medical Theory of Gymnastics.—This theory follows on Professor William H. Welch's thesis, "Adaptation in Pathological Processes" as presented in 1897. Welch taught that adaptations in pathological processes do not lead to rational adjustments to the changed conditions created by disease. He said, "I fail to see in pathological adaptations that coordinate and special fitness which we are accustomed to find in physiological adaptations." He illustrated this statement with examples chosen from pathological anatomy, arriving at the conclusion that since pathological adaptations are not reliable therapeutic adaptations "there is ample scope for the beneficient work of the physician and surgeon."

In connection with Welch's important theory, the Committee has considered the question as to the degree of "fitness,"—this term here being used in Welch's sense—of those adaptations which occur in response to physical exercise and training. The result was obtained that such adaptations are invariably "intelligent" and "rational," well fitted to deal with the functional situation which gives rise to them In other words, it seems that the biological principle underlying physiological adaptations is entirely different from that which underlies adaptations in pathological processes.

It therefore appears that exercise and physical training may not be looked upon as a universally applicable method of achieving and maintaining health. Conversely, measures destined to eradicate illness are frequently not designed to restore or develop physical efficiency which in the mind of the average patient, however, is synonymous with and indicative of fitness as well as of health.

In the Committee's opinion this theory has far-reaching implications upon the future of medicine as well as of physical education. In order to carry out their social obligations, both these sciences will have to join forces and collaborate much more closely than has hitherto been the case (20).

Physique and Character.—A third theory has been developed in an attempt to establish a link between current concepts of psychosomatic research and of clinical psychology on the one side, and scientific evidence in the field of physical education on the other. Most of the latter has not yet penetrated into medicine, much to the disadvantage of both, i.e., physical education and medicine. While many studies have been conducted as to physical correlations of a variety of psychiatric conditions as well as to the psychological equivalents of manifold physical diseases, little attention has so far been paid to an analysis of those relationships between mind and body that are involved under normal conditions in athletics and sport.

The theory of physique and character is based upon Kretschmer's classical thesis. As is generally known, Kretschmer worked in the psychiatric clinic. By applying his concepts to the science of physical education, a link has been established between the latter subject and a vast field of clinical research which has thus been opened for further study (28).

Adaptation Energy.—The theory of adaptation energy is based upon evidence to the effect that in adjusting itself to a variety of environmental strains, such as high or low temperature, exercise, infection or certain poisons, the body "uses up" a considerable amount of basic energy. Selye who has studied the problem, concluded that "some principle not replaceable by food intake is expended during the process of adaptation." He found that while adapting itself to one stimulus (e.g., cold), the body's ability to deal with other physiological strains (e.g., heat) is lessened. Adaptation to any stimulus is acquired at a cost, namely at the cost of adaptation energy. Wherever two or more strains of a different kind act simultaneously, or if a single strain becomes too strong, or if insufficient time is available for rest and recuperation after periods of stress, the organism's capacity for adjustment and thus its general efficiency are likely to suffer.

It therefore appears that the organism possesses, as it were, a pool of unspecific basic energy which it uses in "driving" a variety of specific physiological services, e.g., in regulating body heat or fuel supply, in exercise, in reproduction, or in intense intellectual effort. Not only is the body capable of complying with such as well as with other demands but if repeatedly and at reasonable intervals confronted with the same kind of physiological task, its capacity to deal with it improves. Improvement which takes place for example in the course of muscular training leads to a higher degree of "fitness." Adaptations of the kind under review are usually specific, i.e., they serve primarily or even exclusively to facilitate the very process of adjustment to a particular physiological situation.

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Research Abstracts

Prepared for the

NATIONAL COUNCIL OF THE RESEARCH SECTION

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BIOCHEMISTRY

Brink, Frank, Jr., and J. M. Posternak. Thermodynamic Analysis of the Relative Effectiveness of Narcotics. *J. Cell. and Comp. Physiol.* 32:2 (October, 1948).

In a multiphase system in equilibrium with respect to a particular constituent its thermodynamic activity in experimentally inaccessible phases equals that measured in another phase. This principle is useful in analysis of chemical effects on living cells where only concentrations in extracellular phases are known. Since narcosis is a process apparently reaching equilibrium this method is applicable to systematic study of the relative effectiveness of narcotics. Ferguson (*Proc. Roy. Soc.* B, 127: 387, 1939) reported that in contrast to greater than thousandfold variation in aqueous concentrations of equally effective doses of many substances, the corresponding thermodynamic activities lie in a relatively narrow range of values. The present calculations show that for many narcotics of different chemical structure, acting on several cell types, equal degrees of effect are produced at approximately equal thermodynamic activities. This conclusion contrasts sharply with findings of Ferguson and of Badger (*Nature,* 158: 585, 1946) both of whom emphasize the progressive increase, in an homologous series of compounds, of the thermodynamic activity at which narcosis occurs. It seems that both of these systematic relations among the activities of narcotic substances can occur. (In these calculations the pure narcotic at the same temperature is chosen as the standard state.) New experimental evidence presented confirms the existence, for some cell types, of the law that equal degrees of narcosis are produced at equal thermodynamic activities.—*Wistar Institute.*

EDUCATION

Birnbach, Sidney B. A Comparative Study of Accident-Repeater and Accident-Free Pupils. New York University, Center for Safety Education, 16 pp. summary of doctoral dissertation. 35c.

A study was made of 600 male junior high school students to attempt to discover those peculiarities that make for accident repetition. The investigation included several aspects: the use of personal interviews of students as a means of selection, examination of school accident records, examination of individual medical record cards, and information from parents. This screening device resulted in the selection of 55 students who were in the accident-repeater groups as against 48 in the accident-free group. The boys in the repeater group had sustained from 5 to 11 accidents through their elementary and junior high school years. Four tests were given to all subjects: the Bell Adjustment Inventory, the National Safety Education Test, the New York State Physical Fitness Standards for Boys, and the Rogers Strength and Physical Capacity Tests.

The evidence accumulated as a result of this study showed the following characteristics: the accident-free group was superior in knowledge of safety, showed better home and emotional adjustment, and was more dependable, industrious, and cooperative. The accident-repeater group showed greater crude strength as measured, superior gymnastic skill, and indications of home, health, and emotional maladjustments. The writer concludes that accidents have a tendency toward being symptomatic of some maladjustment, perhaps social, emotional, or mental, and suggests further that schools become cognizant of this and provide adequate psychiatric and psychological services to overcome these difficulties.—*Granville B. Johnson.*

Fattu, Nicholas. Some Variations Among the High Schools Represented at Indiana University. *Bulletin of the School of Education,* Indiana University XXIV:4 (July, 1948), 24pp. Indiana University Bookstore, Bloomington. 50c.

The data for this study represented 153 high schools sending 10 or more students to Indiana University during the school year 1946-7, and represented 80 percent of the students enrolled that year, i.e., those from high schools in Indiana. Data on the students were obtained from student certification blanks, personal data blanks filled out during registration, entrance test scores filed at the office of the dean of students, and grade sheets at the registrar's office.

Entrance examinations indicated that the best schools had median scores in certain instances from four to six times larger than those of the poorest schools. Evidence on college marks and high school rank suggested that certain high schools prepared their pupils more adequately than did others.

The educational attainment of parents of Indiana University students was found to be three school grades above that of the general Indiana population.

In the appendix of the bulletin may be found codes for the high schools involved so that administrators may compare the results of the study of their high school's graduates with the graduates of other schools. This information should be of great value to the school administrators in Indiana.—*Carolyn Bookwalter.*

Hecht, Carol, Ruth J. Grine, and Sally E. Rothrock. The Drinking and Dating Habits of 336 College Women in a Coeducational Institution. *Quarterly Journal of Studies on Alcohol,* 9:2:252-258 (September, 1948).

Three hundred and thirty-six women of upper sophomore, junior, and senior standing in a coeducational institution were studied by means of questionnaires distributed personally and by interviews after 11:00 P.M. when girls had returned from dates. Specific information was sought for the two-week period preceding the filling out of the questionnaire.

Twice as many drinkers as non-drinkers were found. Non-drinkers were slightly older than regular drinkers and were found to attend church more often. There seemed to be a relationship between drinking and frequency of dating. The median of dating for the regular drinkers was 9.35 dates for the two weeks preceding the questionnaire, while the median for the non-drinkers was 5.20. A greater proportion of the non-drinkers was engaged or "going steady" than were the drinkers. The non-drinkers who were engaged dated as much as the regular drinkers. No relationship appeared between frequency of drinking and academic record.

Comment: These findings are interesting, but should be accepted with discretion in the light of the way the questionnaires were distributed, the way of

classifying drinkers, and the time covered by the questionnaire.—*Carolyn Bookwalter.*

Hoff, Charles. Trends of Enrollment, Fees, and Salaries in 288 Colleges and Universities. *School and Society,* 68:1761:214-217 (September 25, 1948).

This study is based upon the return of 288 questionnaires in 1948 from colleges and universities covering nearly one-half of all the college students enrolled in the United States.

Enrollments in 1947-1948 were found to be 80.1 percent above the 1940-1941 enrollment. Only 92 of the 288 institutions stated they expected larger increases in 1948-1949. Veteran students comprised 47.1 percent of the entire student enrollment. It was estimated that this would decrease in 1948-1949.

Two hundred and twenty-five colleges and universities have increased their tuition rates since 1940-1941; 61 made such increases in the past year. It was anticipated that tuition fees in all schools would average 16.9 percent higher in 1948-1949 than in 1947-1948. Non-resident fees were considered a minor item prior to 1944; the non-resident fees now average $160.00 a year (two semesters).

Salaries for faculty and staff have increased an average of 36.7 percent since 1940-1941. There was an anticipated increase of 8.3 percent for 1948-1949. Custodial and maintenance employees have had an average increase of 47.5 percent above 1940-1941.

In 1947-1948 instructors received an average annual salary for nine months' service of $2,723 (range: $1,300-$5,300); assistant professors averaged $3,344 (range: $1,500-$5,400); associate professors averaged $3,866 (range: $1,650-$6,650); professors averaged $4,560 (range: $1,800-$9,367); and deans averaged $5,878.

Of the 280 institutions responding to the question, 97 maintain trailer camp facilities. Temporary housing is maintained by 184. Provision for housing for faculty was reported by 187 out of 280 replies. A total of 263 out of 280 reported operating permanent student dormitories. The average dormitory room rent for a single room was $28.33 per month.—*Carolyn Bookwalter.*

Richey, Robert W., and William H. Fox. An Analysis of Various Factors Associated with the Selection of Teaching as a Vocation. *Bulletin of the School of Education,* Indiana University, XXIV:3 (May, 1948), 58pp. Indiana University Bookstore, Bloomington. 50c.

The anonymous questionnaire technique was used in collecting the data for this study. The carefully prepared questionnaire was administered to 1,615 students taking the first two required English composition courses at Indiana University, 1947-48. The results of the study will be of interest to school administrators and to educational guidance personnel as well as to the general public.

The younger women students and older men students showed a preference for teaching as a vocational choice. Men from rural areas, villages, and small cities, and women from rural areas, villages, and large cities showed an inclination to go into teaching. Those who selected teaching as a profession had had more experience of a teaching nature than had those who decided not to be teachers.

The students listed the desirable and undesirable features of teaching. Salaries and working conditions were prominently listed as undesirable as well as desirable features of teaching. Undesirable features of teaching mentioned were restricted private life, monotonous and routine work, low social standing, restricted opportunity for advancement, rudeness and insolence of

children, parental interference, too much responsibility, involved politics, and lack of tenure. Desirable features of teaching which were listed were work with young people, social service possibilities, steady employment, opportunity for self-improvement and advancement, good vocational prestige, and personal satisfaction.—*Carolyn Bookwalter.*

PHYSICAL ANTHROPOLOGY

Goff, C. W. Anthropometry of a Mam-Speaking Group of Indians from Guatemala. *Am. J. Phys. Anthrop.* (ns) 6:4 (December, 1948).

In order to compare living Indians of Zaculeu with uncovered remains of pre-Columbian inhabitants of the same area, 61 mature males were measured and studied. Careful selection of those of the Mam-speaking group was intended to restrict analysis to the supposed descendants of the builders of the pyramids and temples now under excavation and restoration by the United Fruit Co. and the Carnegie Institution of Washington. Pertinent medical observations and metric measurements show the male Indian to possess a mean cephalic index of 78.8 ± .28; a body build index of 54.4 ± .25 with good posture and a constitution well adapted to a high, rugged environment. Teeth were excellent; blood pressure systolic 116.9 ± .88; diastolic 72.8 ± .55; pulse 68.9 ± .63; upper extremity strength diminished as compared with that of the lower extremities. Other interesting characteristics and observations are recorded. These data from the Department of Huehuetanango show good agreement with those of d'Aloja but considerable variance with those of Byers.—*Wistar Institute.*

Reynolds, Earle L., and Toshiko Asakawa. The Measurement of Obesity in Childhood. *Am. J. Phys. Anthrop.* (ns) 6:4 (December, 1948).

A series of 167 children from the Fels Research Institute were ranked by degrees of obesity shown, using 5 different methods: weight, weight/height, total fat, fat/weight, fat/height. The 50 children thus selected as "obese" were individually examined, in terms of body bulk and differential tissue patterns. Five types were established: obese, mixed obese, relatively obese, relatively mixed obese, and not obese. The efficiency of the 5 original methods is examined, using these types as standards. No one method of selecting obese subjects is entirely satisfactory. It is suggested that failure to differentiate types of obesity, and inclusion of subjects who are actually not obese, may account for conflicting results in studies in human obesity.—*Wistar Institute.*

PHYSIOLOGY

Asmussen, E., and O. Boje. The Effect of Alcohol and Some Drugs on the Capacity for Work. *Acta. Physiol. Scandin.*, 15:109-113 (1948).

The effect of several drugs which are sometimes used by professional athletes was investigated. Subjects rode on a bicycle ergometer simulating sprints and medium distance runs. It was found that in subjects who were fresh before the tests, strychnine and nitroglycerine had no "lifting" effect. Caffein had no effect in sprint exercise and slight effect in longer exercise. Alcohol in small quantities (blood alcohol up to 0.6 per thousand) had no effect; larger doses had a definite deteriorating effect, especially in endurance tests.—*Peter V. Karpovich.*

Asmussen, E., W. v. Dobeln, and M. Nielsen. Blood Lactate and Oxygen Debt after Exhaustive Work at Different Oxygen Tension. *Acta. Physiol. Scandin.*, 15:57-62 (1948).

Capacity for work at a decreased oxygen tension was diminished but the maximum blood lactate concentration and the oxygen debt remained practically

the same as at normal oxygen tension. When pure oxygen was supplied, the capacity for work increased but the maximum blood lactate concentration remained the same as before.

In 1936 Edwards found that at high altitude the maximum blood lactate concentration after exhaustive work was much lower than at sea level. The authors explain this observation as indicating progressive weakening of experimental subjects which led to diminution of capacity for anaerobic work.—*Peter V. Karpovich.*

Horvath, S. M., H. Golden, and J. Wager. Some Observations on Men Sitting Quietly in Extreme Cold. *J. Clinic. Investig.*, 25:709-716 (1946).

Forty-five young men dressed in Arctic clothing sat quietly at various temperatures, the lowest being —40°C. Metabolism gradually increased to almost 74 percent above basal. Since there was no shivering during the first hour, rise in metabolism could not depend on shivering alone. Rectal temperature showed a slight drop; 35.4°C was occasionally observed. Skin temperature fell. Toe temperature as low as 0°C was recorded.—*Peter V. Karpovich.*

Kemp, C. R., W. D. Paul, H. M. Hines. Studies Concerning the Effect of Deep Tissue Heat on Blood Flow. *Arch. Physic. Med.*, 29:12-16 (January, 1948).

Short-wave diathermy and microwaves in dosages sufficient to raise muscle temperatures were applied to the hindlimbs of anesthetized dogs, and the blood flow was measured by means of a bubble flow meter either in the femoral artery or vein. Diathermy failed to produce an expected increase in blood flow. On the contrary, a frequently significant decrease was observed. On the other hand, in most cases microwaves caused an increase in blood flow.—*Peter V. Karpovich.*

Wise, C. S. The Effect of Diathermy on Blood Flow. *Arch. Physic. Med.*, 29:17-21 (January, 1948).

Effect of diathermy applied to forearms of men upon the blood flow in the same limb was studied by means of a plethysmograph. In all cases an increase in the blood flow was observed. The author questions contrary findings and technic used by Kemp, Paul, and Hines, whose article appears in the same issue of *Arch. Physic. Med.*—*Peter V. Karpovich.*

TESTS AND MEASUREMENTS

Lehsten, Nelson. A Measure of Basketball Skills in High School Boys. *The Physical Educator*, V:5, 103-109 (December, 1948).

Eight empirically selected items (height, baskets per minute, forty-foot dash, vertical jump, squat thrust for 10 seconds, dodging run, free throws out of 10 and wall bounce) were administered to 86 high school boys in three days with the aid of trained squad leaders. The scores on the items were scale-scored and then totaled to form battery scores. The battery scores were correlated with ratings by a jury of five men who each rated each boy three different times in a basketball game. The observation check list upon which the players were rated on the basis of 1 to 5 included items such as passing, dribbling, footwork, faking, team play, eye-hand coordination, aggressiveness, competitive spirit, physical condition, speed, agility, etc. The correlation of the battery scores with the average rating by the jury produced an r of .80. Intercorrelations of the items produced no high correlations and a few negative ones. Correlation of items with the total battery scores produced five correlations of .70 or better. On the basis of these latter correlations a five-item battery is recommended as a substitute for the eight-item battery. These five items are: dodging run, forty-foot dash, baskets per minute, wall bounce, and vertical jump.—*Carolyn Bookwalter.*

Manson, Morse P. A Psychometric Differentiation of Alcoholics from Non-Alcoholics. *Quarterly Journal of Studies on Alcohol,* 9:2:175-206 (September, 1948).

One hundred and twenty-six alcoholics (84 males and 42 females) and 157 non-alcoholics (42 abstainers: 18 males and 24 females; and 115 social drinkers: 58 males and 57 females) were studied. These ranged in age from 19 to 66 years. The average age of the men alcoholics was 42.6 years, while for women it was 39.8 years. For the non-alcoholics the average age for men was 38.5 years, while for women it was 39.5 years. All subjects were of the white race and had above fourth-grade reading ability. There were no psychotics in the group.

A 470-item questionnaire was given each of the subjects. This was finally broken down to a 72-item diagnostic test, with a reliability coefficient of .94, which distinguished between the alcoholics and the non-alcoholics. The test has been named the *Manson Evaluation.*

Alcoholics were found to differ from non-alcoholics in anxiety, depression fluctuations, emotional sensitivity, feelings of resentment, failure to complete social objectives, feelings of aloneness, and poor interpersonal relationships.—*Carolyn Bookwalter.*

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Kansas (2): Reginald Strait; Eva Lyman.
Minnesota (2): Ralph Piper; P. J. Sandell.
Missouri (3): Helen Fahey; William H. Lyon; Catherine Barr.
Nebraska (1): Louis E. Means.
North Dakota (1): L. R. Marti.
South Dakota (1): (No report).
Wyoming (0): None.

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Eastern District

Connecticut (2): Mrs. William Zang; Harold S. DeGroat.
Delaware (1): W. Calvin Wood.
District of Columbia (2): Virginia Dennis; Birch Bayh.
Maine (1): Howard G. Richardson.
Maryland (2): Thomas C. Ferguson; Elmon Vernier.
Massachusetts (3): Mary Gibbons; Perry W. Bean; Meldon Wenner.
New Hampshire (1): John F. McGrail.
New Jersey (3): Margaret C. Brown; Dorothy Simpson; Warren Fogarty.
New York (6): Ellis Champlin; Lloyd O. Appleton; Dorothy Zirbes; Carroll H. Smith; Marie R. Schuler; John H. Shaw.
Pennsylvania (4): Karl Oermann; Wilfred C. Collins; Lowell C. Drake; Elmer B. Cottrell.
Rhode Island (1): Martha Jones.
Vermont (1): (No report).

Midwest District

Illinois (5): Arthur H Steinhaus; Haro'd G. Weldin; Maura Conlisk; Ray Duncan; Jane Axtell.
Indiana (3): Robert Yoho: Clarence Biedenweg; Florence Curtis.
Michigan (3): Gladys Ferguson; George Meade; Lloyd Olds.
Ohio (3): Edwina Jones; Paul Landis; Carl T. Nessley.
West Virginia (2): Robert Jameson; Charity White.
Wisconsin (2): Marie L. Carns, Clifford B. Fagan.

Northwest District

Idaho (1): Leon Greene.
Montana (1): Inga Hoem.
Oregon (2): Vernon Gilmore; Marjorie Herr.
Washington (2): Jess Puckett; Virginia Shaw.

Southern District

Alabama (2): Geneva Myrick; Mrs. Jessie G. Mehling.
Arkansas (1): Mrs. Marjorie Mills.
Florida (2): Grace Fox; Catherine Sample.
Georgia (2): Mrs. Mary E. L. Soule, Ernest B. Smith.
Kentucky (2): E. B. Whalin; Sue Hall.
Louisiana (2): Henry O. Dresser; Caro Lane.
Mississippi (1): (No report).
North Carolina (2): (No report).
Oklahoma (2): Paul Alyea; (One to be selected).
South Carolina (1): (No report).
Tennessee (2): (No report).
Texas (3): D. K. Brace; Lloyd Russell; A. A. Buschman.
Virginia (2): Harold K. Jack; Fanny Crenshaw.

Southwest District

Arizona (1): John L. Barringer.
California (5): Verne Landreth; Howard Bell; Anna Espenschade; David Cox, Duane George.
Nevada (0): None.
New Mexico (1): (No report).
Utah (1): Walter Brooks.

AFFILIATED ORGANIZATIONS

American Academy of Physical Education: Jay B. Nash.
American Physiotherapy Association: Esther Gilman.
American School Health Association: C. H. Keene.
Boys' Clubs of America, Incorporated: Walter M. Hall.
Canadian Physical Education Association: A. S. Lamb.
College Physical Education Association: L. Carroll Adams.
Delta Psi Kappa: Elizabeth Moore.
National Association of Physical Education for College Women: Helen Hazelton.
National Collegiate Athletic Association: Frederick W. Luehring.
Phi Delta Pi: Mary Elizabeth McCoy.
Phi Epsilon Kappa: Wilbur DeTurk.
Physical Education Society of the YMCA's of North America: Marshall L. Walters.
Society of State Directors of Health and Physical Education: Paul E. Landis.
YWCA Health Education Directors' Society: Mary M. Weeks.